VISUAL AND AURAL MONITORING, WORD PROCESSING,
AND VOICE SYNTHESIZATION: FOUR CASE STUDIES OF
ADULT NON-ENGLISH LANGUAGE BACKGROUND WRITERS

BY

SHARON STAGGS MOYA

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1987

ACKNOWLEDGMENTS

I wish to express my gratitude and appreciation to the following individuals, who have contributed to the completion of this dissertation.

I am particularly grateful to Dr. Clemens L. Hallman, the chairman of my committee, for his continual encouragement throughout my doctoral program, his valuable input into this dissertation, and his ever-present positive attitude.

I am also deeply grateful to Dr. Ruthellen Crews, who so willingly gave of her time and knowledge in helping me complete this dissertation. Her dedication and commitment serve as an inspiration to me.

I wish to thank Dr. Elroy J. Bolduc for the training he gave me on microcomputers, for the encouragement he offered me about pursuing my interest in computer learning, and for his valuable suggestions in the writing of this dissertation.

My sincere appreciation is also extended to Dr. James W. Longstreth and Dr. Eugene A. Todd, who served as members of my committee and who offered valuable suggestions and encouragement.

TABLE OF CONTENTS

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

VISUAL AND AURAL MONITORING, WORD PROCESSING,
AND VOICE SYNTHESIZATION: FOUR CASE STUDIES OF
ADULT NON-ENGLISH LANGUAGE BACKGROUND WRITERS

BY

SHARON STAGGS MOYA

December, 1987

Chairperson: Dr. Clemens L. Hallman
Major Department: Instruction and Curriculum

The microcomputer as a tool for writing is becoming a
major component in the composition classroom, yet basic
questions remain about how this tool may influence the
writing process. One of these basic questions was addressed
in this study: Might visual and aural behaviors during
writing be affected by writing by a medium that changes the
nature of sensory feedback?

To investigate this question, four Spanish-speaking
non-English language background adults unskilled in writing
in English were observed throughout the writing of nine
essays. Three subjects wrote the first three essays using
the traditional paper and pen method, the next three essays
using word processor, and the last three essays using a word
processor with voice synthesization capabilities. The
fourth subject wrote all nine essays using paper and pen and
served as a control subject for the practice effect.

Observational data on the visual and aural behaviors used during writing were recorded for each subject. These data were supplemented by data provided through interviews, audiotaping of each writing session, and the written products. Individual data were analyzed to determine if changes in the writing process of the individual subjects occurred concurrently with changes in the writing medium. Individual data were then synthesized to determine if any patterns could be found across individuals.

An increase in visual monitoring of the written work with a substantial decrease in generation of words was seen for those subjects utilizing the word processor. There was also evidence that although revisions occurred at approximately the same rate no matter what medium was used, increased visual monitoring while using word processing helped subjects find word level errors, primarily spelling and typographical errors. No changes in aural behaviors were observed when the writing medium was changed to word processing.

Finally, when word processing was combined with voice synthesized oral feedback, two of the three subjects offered this medium for writing elected not to use voice synthesization feedback consistently because it distracted them. However, a third subject used the voice synthesizer feedback and corrected errors that had not been observed when using visual monitoring alone.

CHAPTER I
INTRODUCTION

There is little disagreement among composition
theorists that one of the most critical skills for obtaining
good writing rests upon the writer's ability to revise
written work; however, a body of knowledge already
accumulating in the field indicates that revision is perhaps
the least practiced component of composition writing among
school-aged writers (e.g., Murray, 1978a, 1978b; Perl, 1978;
Pianko, 1977). Teachers of composition are not ill-informed
concerning the necessity of revising in order to obtain
polished essays; in fact, most teachers are keenly aware of
the critical part that revising plays in the composition
process. At the same time teachers have often been hesitant
to demand this practice from their students and for a good
reason.

Writing is, first and foremost, a mechanical act that
requires the hand to work together with the brain and eyes
as written products evolve (Emig, 1978). Because this
mechanical act is often laborious and time-consuming,
teachers may hesitate to ask students for more than one or
two drafts of a composition. Additionally, because so much
time in the writing process is filled with attending to the

1

mechanical aspects of writing, little time remains to focus attention on the global skills of writing that are a major component of the revision process.

With the advent of the microcomputer and easy access to word processing packages, teachers may now have at hand a tool that allows them to change their whole way of teaching the writing process because word processing can help eliminate many of the problems associated with the mechanical aspect of writing. By simplifying the physical act of writing, word processing can allow the writer to concentrate on the more global components of writing. Knowing that students can easily revise their work, teachers can become freer to make revision an integral part of the composition process of their students. However, before the computer used as a tool for writing enters the composition classroom on a widespread basis, it is first necessary to determine the educational outcomes of using this medium in the writing process.

Determining the outcome of methods and materials used in any classroom is no easy task, but the composition classroom presents unique difficulties, primarily due to the nature of the writing act itself. Despite pioneering efforts such as those of Emig (1971), Graves (1973), Perl (1978), and Pianko (1977), teachers and researchers are just beginning to understand the dynamics of the writing process

and to uncover the many and diverse variables that operate when one sets about the task of writing.

Understanding how a computer may affect the writing of non-English language background (NELB) students proves even more difficult. Although there is a small, growing body of research on the composing processes of non-English language background students, less is known about writing in English-as-a-second language than about writing in English-as-a-first language, and the outcomes of using a computer as the tool for writing with this group of students are even more tenuous.

Statement of the Problem

In studies on the writing process, subjects' visual behaviors such as rereading parts or the whole of the product or scanning the product were observed during the writing process. Additionally, subjects' aural behaviors such as rereading the product out loud and commenting on the product were observed during their writing. Both the visual and aural behaviors observed in these studies indicate that the visual and auditory modes provide sensory feedback to the writer that is used in helping the writer continue forward in the writing process.

The information obtained about visual and aural behaviors during writing has been derived almost exclusively from studies of writers utilizing the traditional paper and pen method. Given this factor and the knowledge that the

microcomputer has entered the composition classroom, the following general question was put forth in this study: Will the writer's visual and aural behaviors during writing be affected by writing by a medium that changes the nature of sensory feedback? That is, will the visual feedback provided by the computer screen when writing by word processor change the writer's visual behaviors during writing, or will simultaneous visual/aural feedback via microcomputer during writing affect the writing process by providing dual sensory feedback to the writer? Six specific research questions were formulated to guide the researcher in the collection and analyses of data:

1. What visual and aural behaviors are used by the subjects when writing utilizing the traditional paper and pen method?

2. What function(s) do these visual and aural behaviors have in the writing process?

3. Does writing by word processor change the nature or frequency of these visual and aural behaviors?

4. Does aural feedback provided by a voice synthesizer reinforce or enhance visual feedback during writing?

5. Is the written product affected by a change in the writing medium?

6. What is subject reaction to using a computer as the tool in the writing process?

<h2 style="text-align:center">Significance of the Study</h2>

Because the study of the writing process of NELB writers has just begun, research that generates data that can be used for theory building concerning the writing of this group is essential. Although some research has been conducted on the writing process of NELB children (Edelsky, 1982; Halsall, 1985; Hudelson, 1984), Zamel's studies (1982, 1983) represent the beginning stages of interest in the writing process of NELB adults. The major significance of the present study is that it has added to the information concerning the writing process of adult NELB writers, thereby aiding the process of theory building.

Interest in the writing process has generated interest in the computer as a tool for writing. This increased interest has opened up a new set of questions about the writing process, some of which were addressed in this study. Information generated from this study has helped in understanding what role the microcomputer can play in the writing classroom.

<h2 style="text-align:center">Definition of Terms</h2>

The following terms are defined below as they are used in this study:

Aural behaviors. Writing behaviors which use the ears as the sensory mode for processing information are defined as aural behaviors in this study. Since oral behaviors (speaking, humming, muttering, etc.) are processed through

the ears, no distinction is made between oral (spoken) and aural in this study.

Laboratory case study. A laboratory case study is an in-depth study of an individual in a researcher-constructed, rather than natural, setting.

Monitoring. This term is used to refer to the "checking" or reviewing of a written product using either the visual or auditory modes.

Non-English language background (NELB) adults. Persons at least 18 years old whose first, or childhood, language is a langauge other than English are considered non-English language background adults for purposes of this study.

Reformulation. Reformulation is used in reference to any writing behaviors that result in a review of or change in the written product. The term includes such behaviors as revising, editing, and rewriting.

Visual behaviors. Any behaviors during writing which use the eyes as the sensory means of processing information are considered visual behaviors.

Voice synthesis. Voice synthesis is the electronic reproduction of human-like speech.

Writing. In this study writing is used synonymously with composition.

Writing process. The writing process refers to how people write rather than what they write. Odell's (1980) definition of writing as "a process of discovery, a process

of exploring, a process of creating, testing, and refining ideas" (p. 140) is used throughout this study as the working definition of the writing process.

Assumptions

There were three assumptions under which the researcher carried out this study. Primary among these assumptions was that the subjects used in this study were of average or above average intelligence. Closely connected to this was the assumption that any writing difficulties demonstrated by a subject were a reflection of some linguistic problem and were not an indication of underlying learning problems. A final assumption was that all sensory functioning in each subject was normal; i.e., subjects did not have any visual or auditory problems, nor did they have perceptual problems.

Scope of the Study

This research was confined to case studies of the writing process of four adult NELB subjects inexperienced in writing in English. These four subjects were Spanish speakers who had reached an intermediate level of English proficiency. Data were collected in a laboratory setting in Barcelona, Spain, over a 5-week period from April 7 to May 14, 1986. Generalizability of the findings may be limited to similar subjects writing under similar circumstances.

Overview of Procedures

Four NELB adults unskilled in writing in English were observed in a laboratory setting during the writing of nine

essays. Continuous observational data on the visual and aural behaviors used during the writing of the nine essays were collected by the researcher. These data were supplemented by data provided by audiotaping each writing session; by data generated through a nonscheduled standardized interview, nonstandard interviews, and a debriefing interview; and by data provided in the writing products.

Data collection was organized into three phases. In each phase the four subjects wrote one essay of three main discourse types (expressing, reporting, and generalizing). The subjects of the essays, the order in which the essays were written, and the writing schedules were constant for all subjects; however, the medium by which the essays were written was deliberately manipulated.

In Phase One the subjects wrote three essays using the traditional paper and pen method. In Phase Two three of the four subjects wrote three essays using a word processor while the fourth subject continued writing by the paper and pen method. In Phase Three the subject using paper and pen continued using this method to write the final three essays, and the others wrote using a word processor that had voice synthesizer feedback that could be used for reading back parts or the whole of the written product.

Data collected were combined and transcribed into written records of each writing session. These records were

analyzed inductively for each individual to determine what changes had occurred in visual and aural behaviors across the three phases. Individual data were then synthesized to determine if any patterns could be found across individuals.

Biases and Expectations of the Researcher

Since data collection involved using the researcher as a primary instrument, it was seen as important to outline any biases and expectations of the researcher that could affect either data collection or analyses. The following were viewed as researcher biases and expectations deemed as most pertinent to the scope of this study:

1.   Cultural and linguistic differences between native speakers of English and non-English language background students make the writing of these two groups both quantitatively and qualitatively different.

2.   These cultural and linguistic differences also make the writing process different for these two groups.

3.   Non-English language background students are particularly constrained by the mechanical act of writing, and word processing can temper this constraint. By freeing the student from the mechanical slowness of writing, word processing can allow the NELB writer more time to spend on the cognitive components of writing, particularly reformulation.

4.   Non-English language background students have a greater preoccupation with errors than do native speakers of

English, and this preoccupation slows down the writing process. By knowing that errors can be easily corrected using a word processor, NELB students will become less preoccupied with errors.

5. Non-English language background students will feel more in control of the writing process by using a word processor, and this new sense of control will have positive effects on their written products.

6. Adults learn languages in two separate ways, by acquiring it as a child does and by conscious language study (Krashen, 1976, 1980). The acquired language acts as a monitor to language use not only in speaking, but in writing as well. Adult non-English language background writers have at their disposal, then, intuitive feelings for the language that can be triggered by various stimuli. By providing NELB students with a tool, in this case the microcomputer with word processing and voice synthesis capabilities, that produces both an auditory and visual stimulus during writing, the possibility of these intuitions being triggered are greater than if only the visual stimulus is present. This increased intuition will result in increased error recognition and in increased awareness of global writing problems.

7. Subjects' written output will increase quantitatively (i.e., compositions will contain more words

per unit of time spent writing) using word processing, and the quality of the product will be equal to or better than that written by hand.

Organization of the Research Report

In Chapter II a review of related literature will be presented. In Chapter III the methodology used in data collection and analyses will be discussed, and in Chapter IV the findings and a discussion of these findings will be presented. Conclusions and implications for teaching and further research will appear in Chapter V.

CHAPTER II
REVIEW OF RELATED LITERATURE

Introduction

Writing is taught as a basic skill throughout schooling, and it is most often taught as a subject in the curriculum. Despite this tendency to compartmentalize writing, it is a skill that cuts across all areas of the curriculum; for example, writing is just as essential in preparing a science report as it is in producing a composition for a writing class. Just as the need for writing proficiency is not limited to a single classroom subject, any study of writing cannot be limited to those observable processes carried out during the writing act. To fully understand the writing process and product of any given person or groups of individuals, one must go beyond the discipline of language arts and see what insight other disciplines may provide in understanding the complex activity of writing.

An interdisciplinary discussion of the many critical variables that go into making up the writing act will be presented in this review of the literature. For ease of presentation, the review of literature will be divided into five major categories which represent an approximation of

disciplines seen as contributing to understanding and interpretation of writing as a cognitive act: linguistics, composition, psychology, sociology, and computer technology.   The five major categories will be further subdivided into pertinent areas of interest critical to the discussion and pertaining to the broader discipline.

Although the researcher will discuss literature as outlined above, she does so with the understanding that the major divisions of this literature review are themselves subject to debate.   It can be questioned, for example, that computer technology and composition are disciplines. Additionally, placement of topics under certain discipline divisions can be disputed.   For example, the researcher's decision to discuss English-as-a-second language (ESL) theory under the category of linguistics reflects her biases rather than general agreement among the academic community as to this categorization.   Finally, it will be constantly evident that often the literature quoted under one discipline could equally pertain to another.   When one is dealing with linguistics, for example, one is also dealing with psychology and sociology, so much so that the subdisciplines of psycholinguistics and sociolinguistics have sprung up in response to this realization.

Despite the somewhat debatable categorization used, it is seen as serving the major purpose of this review, i.e.,

illustrating the complexity of the writing act and the need for an interdisciplinary approach to the study of composition.

Linguistics

Definition of Linguistics

In the broadest sense, linguistics is the study of language; however, this simplified definition obscures the rich diversity of activities undertaken by linguists. This diversity is perhaps best illustrated by a partial listing of subspecializations within the field: anthropological linguistics, applied linguistics, contrastive analysis, dialectology, discourse analysis, error analysis, historical linguistics, language acquisition, lexicology, morphology, neurolinguistics, paralinguistics, phonology, psycholinguistics, second language acquisition, sociolinguistics, syntax, and theoretical linguistics. From this incomplete list, it can be seen that any investigation that concerns language is concerned with linguistics by default. Linguistics, like writing, is an area of specialization that is multifaceted and interdisciplinary, and its importance in understanding the writing process cannot be underestimated.

Contribution of Linguistics to the Understanding of Writing

Language acquisition. There is common agreement in the field of linguistics that humans are born with an instinct

for language; but as Bolinger (1968) pointed out, this
instinct is for no particular language. Rather, the
instinct is molded and developed by the culture and
linguistic system into which a child is born. Competence in
language comes

> from applying the instinct to the system through
> the relatively long period during which the child
> learns both to manipulate the physical elements of
> the system, such as sounds and words and syntatic
> rules, and to permeate them with meaning.
> (Bolinger, 1968, p. 3)

Burton White (1975) reported that in at least one language
skill, that of understanding, children may acquire
competence in its entirety by the age of 3 years. Another
assertion frequently found in the literature is that
complete control of language is obtained by the time a child
reaches 5 or 6 years of age. Despite these claims, it
appears that language is never completely learned; rather,
the processes continue throughout life, although at
diminishing rates (Bolinger, 1968).

Chomsky's (1965) distinction between competence and
performance may explain in part this discrepancy in points
of view about language acquisition. As Chomsky explained,
linguistic theory is concerned primarily with

> an ideal speaker-listener, in a completely
> homogeneous speech-community, who knows its
> language perfectly and is unaffected by such

> grammatically irrelevant conditions as memory
> limitations, distractions, shifts of attention and
> interest, and errors (random or characteristic) in
> applying his knowledge of the language in actual
> performance. (p. 3)

Clearly, it would be quite difficult to find a person whose
linguistic performance matches this idealized prototype of
competence. Chomsky's distinction between competence and
performance aids in understanding the difficulty encountered
in trying to determine an individual's actual linguistic
knowledge and competence based upon observed performance.
It also helps explain the disagreement among linguists
concerning the age limits to oral language acquisition.

Speaking-writing relationship and language
acquisition. Writing is the written representation of
language whereas speech is the oral representation, and
whatever is known about the acquisition of spoken language
has direct implications for the understanding of the
acquisition of written language (Falk, 1979, p. 437). This
is not to imply, however, that there is a direct parallel in
the acquisition of these two linguistic skills. As Barritt
and Kroll (1978) pointed out, oral language and written
language are alike in that they both are governed by rules
of syntax and semantics and have as a goal communication.
On the other hand, they differ in that oral competence is
acquired earlier and more quickly than writing competence

and speech is acquired naturally whereas writing must be learned through instruction.

Vygotsky (1962, 1978) further delineated differences in speaking and writing when he argued that speaking and writing are different psychological processes and that beginning writers are weaker writers because of their dependence on spoken language. He proposed that two different cognitive pathways exist from thought to expression in speaking and writing. He used the term "inner speech" to describe the verbal thought that precedes expression and suggested that translation of inner speech is a fairly simple matter in spoken language, but that it is more difficult when the end result is written language. Collins and Williamson (1981) drew upon Vygotsky's theory to test the idea that beginning writers abstract their meaning from spoken language, resulting in semantic abbreviations (incomplete representations of cultural and situational contexts) which affect the written product. They analyzed 60 essays written at grades 4, 8, and 12 and found that semantic abbreviation is indeed a characteristic of weak student writing and that dependence on spoken language is a source of semantic abbreviation. Shaughnessy (1977) also suggested that dependence on spoken language in writing is a source of error. These works, then, support the theory that speaking and writing are different processes.

Barritt and Kroll (1978) discussed two other important differences between written and spoken language. First, in spoken language one feels an immediacy of audience that is not present in written language. The important immediate feedback given by the listener aids the speaker in proceeding with the communication. This sense of audience is further removed from the writer, and no immediate feedback is provided to guide the discourse. Secondly, in speaking a person can focus complete attention on production whereas in writing the physical processes must also be attended to, thereby slowing down communication. In this slowing down, the writer can easily lose track of meaning.

In summary, it can be said that linguists think of speech and writing as parallel and complementary forms of communication (Prator, 1980), but it appears that these two linguistic skills are linked to different cognitive processes and the acquisition of writing differs in significant ways from the acquisition of oral langauge.

Second language acquisition. According to Bolinger (1968), if the theory of instinct for language is correct, this instinct fades quickly with age. We either lose our ability to absorb language or the desire to apply it. If we do not lose our capacity to absorb, perhaps our habits of a first language are so ingrained that we have difficulty separating them from the learning of a second language. Each new skill in the second language involves not only an

ordering of our new knowledge, but also a reorganization of what can be classified as knowledge in our first language. In this sense, then, we can say that a second language is learned through the medium of the first language. This results in both advantages and disadvantages to the second language learner.

Primary among the advantages is the ability to systematize and regularize information concerning the target language almost concurrently with exposure to it (Taylor, 1975). This systematization allows the second language learner to draw generalizations about the language that act as an invaluable tool in the learning process. At the same time, however, these generalizations may become too broad, thereby causing interference in learning the target language. Taylor's (1975, 1983) work with adult second language learners indicated that the adult learner is strongly motivated to reduce the learning burden and this accounts for the errors that arise out of this dependence on first language information. With increased proficiency in the second language, however, learners come to rely less on their first language and more on the second language, coping with it directly and overgeneralizing.

Despite these obvious problems in learning a second language, there is evidence that second language learning shares characteristics with first language learning. As Ervin-Tripp (1974) pointed out, if the human brain is so

capable of dealing with first language learning, there is no reason to believe that it is any less capable in second language learning. In the study she conducted on children learning French in Switzerland, she found several similarities between second language acquisition and first language acquisition: (a) learning occurs first for material which is predictable and for which meaning is apparent, (b) items that can be interpreted are best remembered, and (c) the first components of sentences to be used for comprehension rules are those easily maintained in short term memory.

Asher (1966, 1969a, 1969b) made the claim from evidence from his research on the total physical response approach to second language teaching that adults may have more difficulty learning a second language because they are not taught in the same manner as children acquire a first language. His contention was that if adults learn a second language by first listening and responding physically to commands without having the pressure of producing language, they learn the language better. This, essentially, is the same manner in which a child acquires a first language. Results of research using this approach to teaching second language give credence to his claim.

Krashen (1976, 1980, 1982) posited the theory that two separate issues are at play in second language learning. According to his hypothesis, adults acquire a second

language in two distinct ways: by acquisition and by learning. In acquisition, they acquire language in much the same way as a child does, through unconscious, informal, implicit learning. Just as a child is not always aware that he or she has learned something, the adult second language learner may be unaware that learning has taken place. Learning, on the other hand, is an explicit, conscious, formal linguistic knowledge, and it is learning that we most frequently see taking place in the language classroom. According to research data collected by Krashen over several years, acquisition is far more important in learning a second language than previously thought and is central whereas learning is actually peripheral. The purpose of learning in language performance is to act as a monitor, or editor, during speech performance. Bialystok's (1980) theoretical model of second language learning approximates this distinction, but Bialystok refers to the different types of knowledge as explicit and implicit linguistic knowledge. Although these authors did not refer specifically to application of their theories to writing, their relevance to writing is evident.

Falk (1979) addressed directly the relationship of language acquisition and writing. According to her argument, the formal grammar, vocabulary, and other components often found in a writing curriculum represent a conscious attempt at describing a language, but they are not

language themselves. If adults learning to write in a second language are similar to children learning to speak, these artificial techniques used in the writing class will not be effective because language acquisition involves an unconscious process, not a conscious one. If we wish to replicate in the writing classroom the natural environment that fosters language acquisition, then we must seek to provide situations and assignments that are meaningful to the students. This argument is not dissimilar to that of Asher (1966, 1969a, 1969b).

In summary, despite the seemingly great barriers that adults must cross in learning a second language, it appears that at least part of the problem lies in our poor understanding of second language acquisition and resulting pedagogical practices that may actually inhibit natural acquisition of a second language. Increased awareness of the dynamics at work in second language acquisition may lead closer to pedagogically sound second language materials and methodologies.

English-as-a-Second Language and Bilingual Education

English-as-a-second language (ESL) and bilingual education are considered disciplines, with theories, methodologies, and materials that characterize them apart from other disciplines. Additionally, although there is a symbiotic relationship between the two areas of concentration, they each have their own theoretical base and

different methods and materials. The decision to discuss these subjects together under the larger category of linguistics is based upon the fact that they represent special instances of language learning; both have as a major concern second language acquisition.

English-as-a-second language is often used interchangeably with the terms English-as-a-foreign language (EFL) and English-for-speakers-of-other languages (ESOL), but there is a distinction between the three terms that should be made despite the fact that materials and methods used in the classrooms may be similar (Croft, 1980). English-as-a-foreign language is the term used when English is the target language and students are seeking to learn it in the same way that an American student studies French or Spanish as a foreign language requirement or because it may be useful for business or travel. The term ESL, on the other hand, is used when students are learning English for more intensive purposes, perhaps to survive in the English-speaking country in which they are living or to follow an intensive course of study that is completely in English. Finally, ESOL is used as a comprehensive term that includes both ESL and EFL. Despite the fact that there are similarities in methods and materials in ESL and EFL, there is a subtle difference in the two terms that makes the cojoining of them into one overall term somewhat inappropriate. The term ESL implies English language

acquisition for purposes of intensive use whereas the term
EFL does not carry this connotation. Despite the fact that
a student may study Spanish for 2 years, for example, it can
hardly be said that Spanish is serving the same purpose that
it might be were the student living in a Spanish-speaking
country. In the same manner, it can be said that student
goals and purposes for English study are different in ESL
and EFL classes.

Bilingual education is set apart from these other
fields in a very important way; namely, it encompasses the
whole learning environment of students seeking to become
proficient in two languages. The role of ESL in bilingual
education is a frequently debated subject within the
profession, and this debate centers around differences in
philosophical bases for implementation of bilingual
education. In a simplified form it can be said that one
camp argues that separate classes that teach ESL to students
whose mother tongue is not English constitute bilingual
education while another camp contends that the use of both
languages at all levels of a student's learning is necessary
for the development of language proficiency and academic
achievement (Andersson & Boyer, 1978). These differing
opinions, as well as financial and practical limitations
such as availability of qualified staff, account for the
classification of bilingual programs into transitional and
maintenance programs. In transitional programs the goal is

to help students achieve English proficiency as quickly as possible in order to mainstream them into all-English classes. This can be accomplished through ESL classes. In maintenance programs, on the other hand, the goal is to provide maintenance and development of the mother tongue simultaneously with development of English language proficiency. It is felt that through this simultaneous language development students will not only have positive cognitive benefits from being bilingual, but will also be able to keep apace of subject matter by having it taught through a language medium that is familiar to them. The ultimate goal of both transitional and maintenance bilingual programs is native English language proficiency, and students are mainstreamed to regular classrooms when it is felt that they have acquired the English proficiency necessary to function successfully in an academic environment. In reality, nonetheless, what often occurs is that students are mainstreamed before this proficiency is attained. This is not necessarily a reflection of poor judgment on the part of school personnel; rather, it may reflect a linguistic phenomenon that has been discussed quite succinctly by Cummins (1981). According to Cummins, students have many different linguistic clues from the environment that help them derive meaning in a face-to-face interchange. These clues may aid students in appearing to have a grasp of English that is sufficient enough to enable

them to study successfully in all-English classrooms, resulting in a decision to mainstream them. In reality, however, without the external clues in face-to-face contact, they may be at a loss. This theory closely parallels Chomsky's (1965) theory that there is a distinct difference between competence and performance in language. Vygotsky's (1962, 1978) work also supports Cummins's theory in that what often happens when bilingual students are mainstreamed is that teachers discover that though the students are quite fluent in spoken English, they can neither read nor write in English. They depend upon environmental clues to translate their inner speech into oral English; they depend upon oral English for writing; and without environmental clues, they have difficulty in both spoken and written English.

Summary

It can be seen that whether the object of interest is first versus second language acquisition, speaking versus writing, or English-as-a-second language versus bilingual education, it is, first and foremost, a linguistic interest. Without the work done in the field of linguistics, professionals concerned with any type of language development or learning would be groping to understand the needs and problems of students. They would also have trouble developing methods and materials. Granted that knowledge in the field of linguistics is anything but complete, without the insight provided by this discipline in

guiding research and pedagogy, language-related professions would be less theoretically based.

<div align="center">Composition</div>

Literature on Writing in English-as-a-First Language

In search of a paradigm. Since pioneering work by Janet Emig (1971), it has been as common to find the name of Thomas Kuhn (1970) within the literature on composition as it has been to find the names of well-known composition researchers and theorists. This is an interesting phenomenon since Kuhn's work dealt with scientific revolutions, not writing theory. What applications have composition researchers and theorists found for Kuhn's description of the structure of scientific revolutions that makes it so important to professionals in the field? Primarily this interest centers around his discussion of what constitutes a paradigm in the scientific field.

By Kuhn's account, scientific fields do not advance by a slow accumulation of knowledge that builds upon preceding knowledge; rather, they develop in sharp stages which cannot be measured by the same standards. Each of these stages is marked by scientific revolutions which are characterized by crises in the field during which time the structure of the field is redefined, reevaluated, and changed. The conceptual structures which make up a field Kuhn refers to as paradigms; and during scientific revolutions, paradigms undergo shifts. Paradigm shifts involve redefining the

techniques, knowledge, research, beliefs, and values of the
scientific field; and what evolves is not a reordering of
old theory, but a new pedagogical base.

Despite the fact that some people argue that
composition is not a science and is neither paradigmatic nor
preparadigmatic (Connors, 1983), others in the field of
composition have found Kuhn's theory of paradigm shift
useful for describing what has been taking place in the
profession during approximately the last 15 years (e.g.,
Mosenthal, 1983; Odell, Cooper, & Courts, 1978; Young,
1978). Although it is not clear exactly when redefinition
of the field of composition began, it is fairly safe to
claim that it began with Emig's work in 1971, which shifted
the focus of interest from product to process in writing
(Curtiss, 1984).

Emphasis in writing has traditionally been on student
product; and as reported by Steinberg (1980), this emphasis
is seen by professionals in the field as needing to be
usurped by interest in the writing process, the "how" of
writing. Recent research in composition has indicated that
interest is indeed shifting in this direction (Britton,
Burgess, Martin, McLeod, & Rosen, 1975; Curtiss, 1984; Dehn,
1979; Edelsky, 1982, 1983; Emig, 1971; Flower & Hayes, 1977,
1980, 1981; Graves, 1973; Halsall, 1985; Mischel, 1974;
Perl, 1978, 1979; Pianko, 1977; Sommers, 1978; Zamel, 1982,
1983). If research is an indication of paradigm shift in a

field, as Kuhn indicated it is, then the field of composition is undergoing a paradigm shift away from overconcern with errors and the final product to concern with writing as a process, with ensuing interest in such concerns as meaningfulness of writing topics, writing environment, and reformulation.

With any paradigm shift, said Kuhn, comes a period of crisis and confusion in the academic field, and confusion perhaps best describes the state-of-the-art in composition at this period of time. Professionals in the field find that the old definition of writing no longer serves their purposes, yet they have incomplete knowledge in the newer paradigm. This confusion, however, allows those in the profession to evaluate what is happening, and with this scrutinization will come a firmer understanding of many components of composition hitherto unrecognized but, nevertheless, critical to pedagogical theory and practices (Brown, 1983; Whiteman, 1980).

The writing process. Ann Humes (1983) pointed out that the research community has traditionally been more interested in reading than writing, and the truth of this statement can be witnessed in the extensive bibliographies on reading pedagogy and research. There is, however, increasing interest in and focus upon writing as not only an important and critical skill, but also a complex cognitive process. Humes reviewed some of the most important research

projects carried out thus far on the writing processes of native speakers of English and described the research methodologies most frequently used in these studies, providing an important overview of writing process research. Humes's overview served as a framework for the following discussion of the writing process.

Odell (1980) defined writing as more than the correcting, spelling, grammar, and usage that have been the focus in composition for many years; rather, it is a "process of discovery, a process of exploring, a process of creating, testing, and refining ideas" (p. 140). It is to this process of discovery that the following works were addressed.

Janet Emig (1971) has already been mentioned in this review of the literature several times and invariably is quoted in most papers dealing with the subject of the writing process. Her work was important not because it carried with it a totally accurate or complete picture of the writing process, but because it was the first in-depth study concerning how students write as opposed to what they write. Her laboratory case study model of writing process research provided other researchers with a methodology for carrying out further studies. Additionally, it provided information about the writing processes of a particular group of students, namely 12th-grade native speakers of English, that could be used in formulating questions for

further research.   In brief, findings from her study included the following:

    1.   Twelfth graders used two modes of composing, reflexive and extensive, and these two modes were characterized by different lengths and different clusterings of components of the writing process.

    2.   The components of the writing process included context (the environment in which writing took place), the nature of the stimuli (whether the writing was school-sponsored or self-sponsored), prewriting and planning (activity prior to beginning the first rough draft), starting (putting down the first words), composing aloud (using the voice as part of the writing process), stopping (terminating the writing act), contemplating the product (thinking about what had been written), reformulation (revising, editing, and rewriting), and the influence of composition teachers on writing.

    Emig's laboratory case study methodology provided others to follow with a viable means for studying the writing process.   The significance of her work goes beyond the question of methodology, however.   Perhaps its greatest significance lies in the fact that it provided insight into the importance of the writing assignment as part of the writing act.   Whether the assignment is self-sponsored or school-sponsored, according to Emig's findings, determines the configuration of the writing process.

Using Emig's work as a guideline, Graves (1973) studied
the writing processes of "normal" 7-year-old children. He
used formal and informal data collecting methods, including
case study, analysis of writing samples, and naturalistic
observation of children while writing. His goal was "to
gain a profile of behavioral patterns associated with the
writing process, in order to formulate instructional
hypotheses and merited research directions in writing"
(p. 1). He examined three phases of the writing process:
prewriting (that which immediately precedes writing),
composing (which begins and ends with actual writing of the
message), and postwriting (all behaviors following
completion of writing, such as proofreading and
contemplation of the product). At the time of his study,
these three phases were frequently used to describe the
writing process, but it will be shown in the following
section that other models of the writing process are being
formulated.

Despite the fact that Graves's description of writing
phases may not accurately reflect the complexity of the
writing act, his study provided important information for
understanding the writing processes of children. Primary
among the insights provided is that children assist the
writing act by accompanying language, such as overt language
(full-voiced), whispering (slight subvocalization),
formation of letters and words by mouth without audible

sound, and murmuring (occasional forming of words and slight voicing). Having this knowledge helps those in the field understand that while writing may be conceived as a solitary and nonverbal act, it is in reality often a social act and much more an oral act than was previously understood. Demanding silence in the classroom while students are writing takes on new dimensions since this discovery.

Besides providing increased understanding of the writing processes of young children, Graves's study demonstrated the viability of studying the writing process as it occurs in a natural environment.

Pianko's (1977) study marked a major attempt at combining the study of process and product in an effort to understand not only the composing process, but what effect this process has on the final product. Her sample included both traditional and remedial writing students at a community college. The following behaviors were found to characterize the composing processes of the entire sample of college freshmen:

1. Little time was spent on prewriting.

2. Most planning occurred during writing, not before it.

3. As much time was spent pausing and rescanning as was spent writing.

4. School-sponsored writing was viewed as something to be done as quickly and superficially as possible.

5. Major reformulation was not part of writing, i.e., the first draft was the final draft.

6. Rereading was done only for small revisions and was not an important component of the writing process.

7. Stopping, contemplating the product, and turning the product in were accomplished as rapidly as possible.

8. School-sponsored writing inhibited the composing process.

9. Students did little self-initiated writing.

10. Writing was not viewed as important in the students' lives.

These findings complemented those of Emig despite the fact that the population was different.

Of most interest is that Pianko found differences in the composing processes of traditional and remedial writers. These differences are summarized as follows:

1. Traditional students spent more time planning before and during writing and rescanned their writing more often for further formulation.

2. Remedial students wrote more slowly because of their concern with error.

3. Style, purpose, and setting were more consciously considered by traditional than by remedial students.

4. Traditional students spent more time on prewriting and self-initiated writing and needed a special place to write.

5. Remedial students wrote less and were exposed less to others writing during elementary and secondary school.

6. Remedial students expressed more satisfaction with their written product than did traditional students.

7. Some remedial writers could not see the importance of writing whereas all traditional writers saw its importance.

8. Traditional writers had a more complete understanding of the writing process than did remedial writers.

Clearly, the implications of these findings for nontraditional student writers are important.

In the product part of her research, Pianko (1977) made the following conclusions:

1. The overall quality of the written product differed in the extensive mode from the reflexive mode.

2. There was a different level of syntatic fluency in the two modes.

3. There was a positive correlation between the overall quality of writing and the level of syntatic maturity.

4. Most writing was transactional, often reporting.

5. Most products were in the extensive mode, supporting the contention that school-sponsored writing does not support reflexive writing.

6. The reflexive mode occurred in transactional writing.

7. Writers were most comfortable writing narration.

The research of Pianko (1977) was limited by the fact that students could be observed only once during the composing act, but it provided information that could be used in formulating new questions concerning the writing process. It was important also because it dealt with the composing processes of college-level students, whereas Emig's study dealt with 12th graders and Graves's study dealt with children, and it illustrated yet another methodology for research in writing. Additionally, through this study it was learned that there may be important differences in the writing processes of traditional and nontraditional students of writing. This information is supported by that given by Shaughnessy (1977) concerning the errors that basic writers make.

Other work in the field of composition has also furthered our understanding of the writing process. The fact that these works will not be described as thoroughly as the three above is not a reflection of their importance; rather, it is an indication that those in the field are beginning to accumulate enough information concerning the writing process to make generalizations that appear to cut across methodologies. The works detailed above were selected to demonstrate varying methodologies applied to

different age levels of students, and not denying their importance, they are but three of a variety of valuable studies carried out on the composing process.

Some researchers' main contributions to the study of the writing process come as a result of the methodologies used in collecting and analyzing their data. These researchers include Blau (1983), Britton (1978), Britton et al. (1975), Flower and Hayes (1977, 1980, 1981), Gould (1980), Marcus and Blau (1983), and Perl (1978, 1979).

Britton (1978) and Britton et al. (1975) found that it was necessary to identify categories of writing in order to analyze the writing samples of different age groupings of writers. Britton described three function categories (transactional, expressive, and poetic) used to distinguish purposes for writing and proposed three stages in the writing process: preparation, incubation, and articulation. His contention was that incubation plays a critical and little-understood role in the writing process. Clearly, these three stages differ from the prewriting, writing, and postwriting stages detailed previously.

Flower and Hayes (1977, 1980, 1981) developed what has come to be considered a powerful tool for identifying psychological processes during the writing act. This procedure, which they called verbal protocol, involves recording in order of time the students' writing behaviors,

including recording all verbalization done by the writers
during composing. Subjects are asked to speak out loud all
the thoughts going through their minds as they write.
Through analysis of this verbalization and the matching of
it to the researcher's written notes, one is able to
ascertain the trains of thought followed by writers in the
different phases of the writing process, thereby gaining
insight into the underlying psychological processes. This
methodology has frequently been used by other researchers in
the field to collect and analyze data.

Perl (1979) is a prominent researcher who not only made
use of protocol analysis, but also added new information to
the developing understanding of the writing process. Her
subjects were unskilled writers at the college level, and
she collected data on these subjects during five 90-minute
sessions. Additional data came from students' writing
products, composing tapes (verbal protocols), and
interviews. A major finding of her study was that all
students displayed consistent composing processes that
followed the sequence of prewriting, writing, and editing.
This, as she pointed out, suggests that there is a greater
internalization of the writing process than was previously
assumed. Lack of proficiency in writing, then, may be
attributable, at least in part, to a slow down in the
thought process caused by concern with error and editing.
This idea would be supported by the work of Shaughnessy

(1977). Other important findings from her research included the following:

1.   Students practiced very little prewriting.

2.   Students wrote by moving back and forth between the sense of what they wanted to say and the words on the paper; i.e., they displayed the recursive techniques of backtracking, rereading, and digesting what had been written before.

3.   Editing played a major role in the writing process from the beginning of writing of the first draft.

4.   Students used selective perception in rereading their work; i.e., they seemed not to recognize that the cues on the page may prove insufficient in meaning to the outside reader.

5.   Students wrote from an egocentric point of view.

6.   Editing intruded so often and at such short intervals that both thinking and writing were interrupted.

7.   Editing was primarily an exercise in error-hunting.

Besides providing important insights, Perl's work demonstrated a graphical and replicable mode of representing the composing behaviors of students during the writing process.

Blau (1983), Gould (1980), and Marcus and Blau (1983) used a procedure in their research that is not only unusual, but also virtually unexplored. This technique, known as invisible writing, has the students write using an inkless

device that records the words on carbon paper without their being visible to the student or using a computer with the monitor turned off. The object of invisible writing is to study what happens when students are not able to use recursive techniques during the composing process. Blau argued that by using this technique writing could become a purely thinking process whereas Gould concluded that good writers are good writers and poor ones, poor regardless of the method of composition used. The research of Marcus and Blau provided evidence against the importance of scanning during the composing process. Despite the work done by these authors, not enough information has been gathered on the technique to be able to expand knowledge on the composing process, but this technique is worthy of further investigation to help determine the roles of thought and sight in the composing process. The relationship of writing and thinking has generally been recognized as crucial in the field (Dilworth, Reising, & Wolfe, 1978; Flower, 1979), but the relationship of writing and vision is yet relatively unexplored.

Works by Curtiss (1984), Dehn (1979), Mischel (1974), and Sommers (1978) have also added to our knowledge of the writing process. Sommers's major contribution to understanding of the writing process comes from her comparison of inexperienced and experienced writers and her focus on revision. Curtiss's ethnographic study

demonstrates how a computer as tool can help foster composition skills given a nurturing writing milieu. Dehn's case studies of first graders illustrate that individuals attack the learning task with their own individual styles, which persist regardless of the teaching method. Finally, Mischel's case study of a 12th-grade writer supports much of the work of Janet Emig and offers further questions for research.

Certain generalizations can be extracted from the diversity of research questions, methodologies, subjects, and findings outlined above, but these generalizations are far from being definitive concerning the composing processes of students. Part of the difficulty with generalizing comes from the fact that it appears that different age groups and different ability levels experience the writing process in different ways. Nevertheless, certain commonalities can be found, as outlined by Humes (1983).

First of all, the linear model of the composing process, i.e., prewriting precedes writing which precedes postwriting, has been discredited. Researchers have increasingly found this model of writing to be inadequate for describing what happens during the composing process. Rather, it appears that writing is a recursive, generative activity. Different models of this process will be discussed in the following section. Secondly, planning appears to be a thinking process that occurs throughout the

composing process. Third, translating, or writing, makes
huge demands on the writers' cognitive processes because the
writer must put ideas into writing while simultaneously
trying to deal with concerns such as audience, style,
coherence, handwriting, purpose, and form. Some of these
skills appear to become automatic with increased practice,
and evidence from some studies suggests that as these skills
become automatized, differences appear in the writing
process. Fourth, studies have shown that most writers
review their work in order to proceed forward. It appears,
however, that young children and inexperienced writers make
less use of review than do older, more experienced
writers. Finally, revising, or reformulating, occurs at all
levels of the writing process. There is, however, evidence
of differential revising abilities between inexperienced and
experienced writers.

These generalizations, as mentioned above, are far from
conclusive, but they provide a base from which new questions
can be asked. In this manner, the yet unfinished picture of
the composing process works its way toward completion and
the field of composition comes closer to having a newly
developed paradigm.

Models of the writing process. Out of research on the
writing process have evolved various models of writing.
Some of these models have been described above, but a
reiteration of these, mention of others, and discussion of

their critical components serve the purpose of illustrating the new emerging paradigm of the writing process.

Models of writing here are referring to theoretical explanations of phases in the writing process and not to models used in the classroom to illustrate principles of composition that teachers wish to have students imitate. One is referred to the discussion of Flanigan (1980) or Watson (1982) if interest lies with this type of composition model.

Graves (1973), as well as other earlier researchers in the field of composition, divided the writing process into three phases: prewriting, writing, and postwriting. These three phases have been shown to inadequately represent the writing process. Components normally considered to be part of one phase have subsequently been shown to exist at many different levels in the writing process; for example, it is now understood that reformulation takes place from beginning to end in writing while it was considered only as part of postwriting under the older model.

Britton's (1978) model also included three stages (preparation, incubation, and articulation), but these phases are in no way parallel to those mentioned above. Preparation could be equated with prewriting, but incubation is also a stage that precedes the actual placing of pen to paper, the articulation stage. Britton's claim is that incubation, the consideration of an idea before it takes the

written form, plays a much more critical role in writing than has previously been thought. What is obviously lacking from this model, however, is a delineation of the type of writing that goes on during the brainstorming phase of the first draft from that writing which takes place once a rough draft has been produced.

Bereiter (1980) discussed five possible forms of organization that are at work in the writing process: associative writing, performative writing, communicative writing, unified writing, and epistemic writing. Associative writing is essentially writing down whatever comes to mind in the order that it comes. This is much like transcribing speech. The fact that children and unskilled writers vocalize or subvocalize suggested to Bereiter that they may be "dictating" to themselves. Most unskilled writing by all students of whatever age is, according to Bereiter, this kind of writing. The second form, that of performative writing, involves an integration of associative writing with knowledge of stylistic conventions. This type of writing has larger cognitive demands, involving attending to the content of writing and to some feature of the emerging written product. Bereiter argued that children's difficulty with revision may be due to this increased cognitive attentional problem. Communicative writing, the third form, evolves when performative writing is combined with social cognition; and unified writing, the fourth form,

comes about when the writer considers not only other people's perspective, but also the writer's own perspective as a reader. The final form, epistemic writing, results when reflective thought becomes integrated with unified writing with the consequence that writing becomes no longer just a product of thought, but also an integral part of thought. To some extent, as per Bereiter, writing is always serving an epistemic function in that knowledge undergoes modification while being written down. In Bereiter's words, "traditional writing instruction, based on style manuals, models, and teacher correction, is almost wholly devoted to moving students from associative to performative writing" (p. 88).

Bereiter (1980) described a development that occurs at the unified writing stage, namely the establishment of an important feedback loop. His theory is that once a person is capable of integrating his or her own reading and writing skills, a feedback loop is developed, and writing then begins to be shaped by what has already been written, resulting in the development of a personal style and viewpoint. The most important consequence of this reading-writing loop is that it leads to viewing the writing product as something to be shaped, thereby moving writing from an instrumental skill to a productive craft.

Bereiter (1980) claimed that there is no natural order to the stages, per se, but that the order in which they are

listed seems to be logically the natural order. Fluency in associative writing tends to free attentional capacity for dealing with performative demands, and attaining mastery over stylistic conventions leads to discovery that writing can be used to affect others (i.e., communicative). When students start writing for others, it seems logical that the next step is for them to start reading their own writing, and this sets up the writing-reading feedback loop on which the unified writing stage depends. When this loop is established, it leads to improved writing and improved understanding; i.e., the loop acts like a dialog with oneself. With this understanding emerges the epistemic stage of writing development.

Although not enough evidence has emerged to support Bereiter's (1980) proposed model of writing stages, his discussion offers valuable insight into how the type of writing demanded of students may make a critical impact on their writing process and into the need to know at what stage students are in order to meet the demands of this stage.

The model proposed by Hayes and Flower (1980) is perhaps the most comprehensive one to date. In their model, which was derived through protocol analysis, there are three major divisions: the writer's long term memory, the task environment, and the writing process. Within the division of long term memory lie the areas of knowledge of topic,

knowledge of audience, and stored writing plans. These components provide input into the writing process. The task environment is subdivided into two major components. In the first are included the variables of writing assignment, topic, audience, and motivating cues. The text produced so far provides the second component. Both of the components provide input into the writing process. The final major division concerns the writing process itself. In this division there are four major components: planning, translating, reviewing, and monitoring. Monitoring is done at all three levels of this component. In the planning phase, the writer receives input from both long term memory and the first component of the task environment. This input helps the writer generate ideas. This generation takes the form of both organizing and goal setting. The output is the translating stage. During this stage there is input into the second component of the task environment, namely the text produced so far. The next, and final, phase is that of reviewing. This phase has as components reading and editing. The purpose of this phase is to improve the quality of the text from the translating phase, and this is accomplished by looking at language conventions and the accuracy of meaning and evaluating if the writer's goals have been accomplished. During the editing process, the writer examines whatever material has been put into words, whether by writing, reading, or speaking, and a loop is

established between the reading and editing phases. The writer reads the next segment of text, edits the segment, and exits the loop if the text is done. If it is not done, however, she or he reads the next segment of text and continues through the loop again until the text is completed. Reviewing and editing differ, according to Hayes and Flower, in that editing is triggered automatically and may interrupt other processes whereas reviewing is a contemplated activity where the writer decides to devote some time to systematic evaluation and improvement of the text, usually after the translating phase.

This model is not a stage model, by Hayes and Flower's own account; rather, it is a recursive model that allows for the intermixing of stages. Likewise, it is a model of competent writers, and it may be that some writers may fail to use some of the processes. Though it is a tentative model, it is built on research done by Hayes and Flower where it was found to work. The authors recommend, however, that it be tested by others only in laboratory settings due to its tediousness.

One of the problems with developing an adequate model is that it seems that writing takes different forms with different age and ability groups. Steinberg (1980) pointed out that researchers may be searching for one model of writing when in reality many models may be needed to explain the writing processes of different groups of people. Part

of the problem, he continued, is that composition teaching is ill-defined. What we must do, then, is first determine the interacting subsets, deal with them individually, and then study their interactions. In order to do this, according to Steinberg, people researching cognitive processes need to reduce the operations being studied to the simplest possible terms in order to study them; once the basic design of the writing process is understood, then one can add on in order of complexity. Until then models of the writing process will, by necessity, remain somewhat naive.

The role of errors, reformulation, and pausing. Errors, reformulation, and pausing play a role in the writing process that is not only important, but also critical for understanding of the total writing process. These three subjects will be briefly discussed in order to provide the reader insight into how they interact during the writing act.

1. Errors. The name most frequently associated with the study of errors in writing is that of Mina Shaughnessy. Her work, Errors and Expectations (1977), provided the theorist and practitioner alike with valuable information about the role that errors play in the writing of basic writers. According to Shaughnessy, for many writers good writing is equated with correct writing, and much about the "remediation" of poor writers encourages an obsession with errors. Other components of writing also often interfere

with the writing process. For example, poor handwriting, like errors, is an indication that the writer is not comfortable with this skill. Likewise, the basic writer is limited primarily to the use of commas and periods for punctuation and is often even uncertain about the use of these punctuation marks. This difficulty has often led teachers to complain that students do not even know what a sentence is. Despite the fact that unconventional punctuation may be difficult to study, Shaughnessay indicated that it is worth studying in order to gain insight into the perception of sentence boundaries held by the student. Without an analytical grasp of sentence structure, basic writers rely on their "intuitions" and must go by what "feels" like a sentence. It has been shown that these intuitions are frequently wrong.

Another type of problem encountered in basic writing, continued Shaughnessy (1977), is that of skips and misses. The skips usually involve small words and are sometimes words that are known to cause trouble for basic writing students. These are, however, the kinds of errors that can be corrected by the writer once he or she sees them, but frequently this is a difficult skill because basic writers tend to see what they think they have written rather than what they have actually written.

Another problem that beginning writers have is that they do not know how writers behave (Halpern & Mathews,

1980; Shaughnessy, 1977). For this reason, they often draw heavily upon their competencies as speakers in order to write, resulting in errors. They also do not plan, nor do they understand that they can say what they want to say and that there is no single answer to the question which they must find. These insecurities of a basic writer are frequently reinforced by teachers who demand formal correctness of the product and ignore the writing process.

An additional pedagogical problem which Shaughnessy (1977) discussed is that basic writing students lack confidence in themselves academically and fear that writing may expose their inadequacies. This results in such problems as avoidance of strong beginnings in favor of safer "in my opinions" and a general backing off, both syntatically and semantically, from the writing.

Shaughnessy's (1977) own words best summarize the role of errors in the writing process of basic writers:

> For the BW [Basic Writing] student, academic writing is a trap, not a way of saying something to someone. The spoken language, looping back and forth between speakers, offering chances for groping and backing up and even hiding, leaving room for the language of hands and faces, of pitch and pauses, is generous and inviting. Next to this rich orchestration, writing is but a line that moves haltingly across the page, exposing as it goes all that the writer doesn't know, then passing into the hands of a stranger who reads it with a lawyer's eyes, searching for flaws.
> By the time he reaches college, the BW student both resents and resists his vulnerability as a writer. He is aware that he leaves a trail of errors behind him when he writes. He can usually

> think of little else while he is writing. But he
> doesn't know what to do about it. Writing puts
> him on a line, and he doesn't want to be there.
> For every three hundred words he writes, he is
> likely to use from ten to thirty forms that the
> academic reader regards as serious errors. Some
> writers, inhibited by their fear of error, produce
> but a few lines an hour or keep trying to begin,
> crossing out one try after another until the
> sentence is hopelessly tangled. (p. 7)

An experiment by Daiute (1981) supports the claim of

Shaughnessy that errors can be categorized and explained,

but little support is needed as the truth of what

Shaughnessy says is clear to anyone who has taught

nontraditional students how to write.

2. Reformulation. As was seen in the discussion on

models, most experts agree that reviewing, revising,

editing, and rewriting play a role in the writing process.

What role they play and at what points in the writing

process they are activated, however, have not been clearly

delineated, for there is no standard definition for what

constitutes revision (Cavin, 1983; Gould, 1980; Kirby &

Liner, 1980; Murray, 1978a, 1978b; M. Schwartz, 1983). For

the purposes of this discussion, these skills will be

considered under one heading, reformulation, and various

perspectives about where they fit into the writing process

will be presented.

Donald Murray (1978a, 1978b) proposed that writing is

rewriting and that rewriting differentiates between the

amateur and professional and the experienced and

inexperienced writer. Yet, he continued, this component of the writing process is the least researched, most poorly understood, and least taught skill involved in the writing act. Despite the fact that writers may skip over some stages in the writing process, Murray is convinced that most writers follow three distinct stages in the writing process: prevision, vision, and revision. He prefers these terms to prewriting, writing, and revision because they emphasize the discovery process involved in writing. Prevision, following Murray's definition, involves all the acts that precede the first draft of writing and includes such receptive experiences as conscious and unconscious awareness, memory, observation, and title and lead writing. Vision, the second stage, is the first draft, the discovery draft. This stage, according to Murray, is the shortest and can often be accomplished in one sitting. The final stage, revision, involves what the writer does once the first draft is completed. According to Murray, since writers do not know what they will say, the first step in revision is vision. The writers must separate themselves from the work and read with care what has been written in order to understand what they were trying to say. Writers often know better what they do not want to say than what they do want to say, and the process of moving toward meaning implies that revision is a cyclical process that

continues until meaning is accomplished. This cyclical process is what is meant by writing as a discovery process.

In Murray's (1978a, 1978b) configuration, there are two forms of revision, internal revision and external revision. In internal revision, writers are trying to discover what they are trying to say; i.e., the audience is the writer. External revision, on the other hand, is done for an external audience and goes into play after the writer has discovered the meaning of what was being written. With external revision writers concentrate on editing and proofreading and seek to polish their form, language, mechanics, and style.

Murray (1978a, 1978b) postulated that much more time is spent on internal revision than external revision, yet most texts emphasize the skills used in external revision and pass over the importance of internal revision. External revision is also often emphasized in writing classes as well, with demands being made on the writer to conform to editorial conventions and little concern being shown for the process of discovery. Additionally, in a product-oriented classroom, rewriting is often communicated as a punishment for not having conformed to external standards. With emphasis being placed on external revision, students do not experience the excitement of discovery and are, therefore, little motivated to make substantial revisions.

An understanding of the processes of revision is as yet incomplete, and Murray (1978a) suggested several possible areas to explore: (a) the process of internal revision; (b) the attitudes that writers hold toward internal revision; (c) how writers read their copies; (d) the skills used during internal revision; (e) the developmental stages significant to the understanding of internal revision; (f) the knowledge needed to understand internal revision; (g) the environment, habits, schedules, and tools influencing internal revision; (h) the language patterns, subject areas, and writing forms that encourage or discourage internal revision; (i) how editors read writing and encourage internal revision; and (j) the curricula, teaching environments, and methods that encourage internal revision.

The work of Mimi Schwartz (1983) also provided increased understanding of the role of reformulation in the writing process. As she pointed out, there is a newly formed enthusiasm centering around revision, but this enthusiasm carries with it irregularities. For example, research shows that good writers revise more than poor writers, yet some good writers revise little and still produce fine writing, and there is no "uniform" pattern of expert revision.

In an effort to characterize individual styles used from start to finish in the writing process, Schwartz (1983) drew upon data collected from a study to extrapolate nine

revision profiles that illustrate how "content and form are generated, organized, and reassessed from intention to revision" (p. 550). She divided these nine profiles into three frameworks. The first framework includes the Overwriter and Underwriter profiles and are language production and regeneration profiles. The second framework illustrates profiles of how writers reformulate initial meanings and includes the Restarter, Recopier, Rearranger, and Remodeler. The last framework contains those profiles for reassessing content based on esthetic and revision criteria. This framework includes the profiles of the Censor, Refiner, and Copyeditor. According to Schwartz, these profiles show the interconnectedness of invention and revision rather than placing revision in isolation, and the schema presented helps those in the field understand that, as research has shown, revision is a recursive, not a linear, process. The three frameworks as outlined by Schwartz are described below.

The terms used to characterize those profiles in the first framework, namely Overwriter and Underwriter, are somewhat self-explanatory. The Overwriter writes more than is needed and then cuts back while the Underwriter writes a small amount and then embellishes it. Whereas everyone may overwrite or underwrite at times, writers have a propensity for one of the categories. The goal for both is the same, however, i.e., to make initial meaning denser. Success for

both depends not on the initial words, but rather on what is done with them later. Experienced Overwriters and Underwriters make wise choices during revision, thereby producing stronger texts while less experienced ones either leave too much of their text in the final copy (Overwriter) or do not embellish the final draft with enough substance (Underwriter).

The secondary framework of profiles is concerned with the way writers react to the structure of meaning of the initial writing. The Restarter may reject the text and start over again, the Recopier may make only a few changes in the text, the Rearranger may put old segments together into a new structure, and the Remodeler may renovate line by line the original structure in order to build upon it. As in the first framework, writers may assume any one of these positions at different times but they follow a dominant profile. Schwartz (1983) postulated that perhaps the most useful profile for teaching revision is that of the Remodeler as it illustrates how students can change their written work from something mediocre to something outstanding.

The final framework is related to the criteria used by the writer in changing a text. The Censor is worried about the propriety of the work for a given purpose and audience; the Refiner is concerned for the accuracy of the work, given the need for clarity and realness; and the Copyeditor

centers on the correctness of conventional forms. The Censor is closely tied to voice, and a breakdown in communication can occur if the sense of audience is so strong that the writer does not hear his or her own voice. The Refiner needs both good revision skills and an esthetic sense in order to work proficiently. Inexperienced writers who lack both these skills make little use of the Refiner, accepting unrefined drafts as final drafts or making poor revision choices. Others may oversimplify in order not to have to refine or may intuitively sense a mechanical problem but incorrectly "fix" it, causing further damage. Still other writers may become absorbed with use of the articles as a way to avoid recognition of indefinite meanings. The final profile, the Copyeditor, depends more on skills than intuition. This profile is critical for completion of a work but may be dangerous when used too soon in the writing process. Being overconcerned with errors in the discovery phase of the writing process may produce error-free texts, but it also may produce texts that are devoid of interest and life. When the Copyeditor is not used at all, on the other hand, excellent content may be obscured by poor form.

The work done by both Murray (1978a, 1978b) and Schwartz (1983) is but a step toward understanding the part that reformulation plays in the writing process. Nevertheless, the information generated by these two authors provides a clearer conception of the many variables at work during reformulation.

3. <u>Pausing</u>. Pausing has been noted by researchers to be practiced by all writers during the composing process, but most frequently pausing occurs during the writing phase and not prior to it (e.g., Perl, 1978, 1979; Pianko, 1977). Gould (1980) and Matsuhashi (1981) found in their studies that pausing occupied well over half of the time during the composing process. Results such as these led Flower and Hayes (1981) to speculate about the nature of pausing. If, they asked, pausing reflects planning, what is the nature of that planning? In an effort to answer this question they formulated two research hypotheses to be tested:

1. Writers pause to generate or plan what they will say next.

2. When writers pause for significant lengths of time, they do so in order to undertake more global planning, which is not necessarily connected to the immediate area of the text.

Since considerable prior research evidence pointed to dependence of sentence-level planning as being a mark of poor writers, the importance of these hypotheses can be seen.

Data were collected using verbal protocols. According to Flower and Hayes (1981), the thought in these protocols fell into important and robust patterns, which they called "composing episodes." They argued that the boundaries

between these episodes were responsible for many of the long pauses during writing. Their findings were the following:

1. Paragraphs were poor predictors of major episode boundaries.

2. Logical topic shifts were not good predictors of episode boundaries.

3. Nearly 70% of comments at the beginnings of episodes were related to goals and nearly 50% of them were devoted to setting goals; i.e., activity related to goals appeared to be a predictor of episode beginnings.

It was the researchers' opinion that these data supported the following conclusions:

1. Planning is carried out at many different levels.

2. The writing process has its own unique episodic pattern.

3. Beginning episodes are made up primarily of goal-setting activities.

Pausing, then, seems to carry with it thought processes that help to generate not only the next immediate part of the writing, but also a cohesive whole. More research is needed in this area, however, before definitive statements can be made concerning the purpose and nature of pausing during the writing process.

Literature on the Writing of NELB Students

Connection with writing in English-as-a-first language. Kaplan (1980) pointed out that

> logic (in the popular, rather than the logician's
> sense of the word) which is the basis of rhetoric,
> is evolved out of a culture; it is not
> universal. Rhetoric, then, is not universal
> either, but varies from culture to culture and
> even from time to time within a given culture.
> (p. 400)

When one is dealing with the writing of the non-English
language background (NELB) student, then, by default she or
he is dealing with not only the usual problems found in
writing, but also those caused by differences in rhetoric.
A common fallacy, as Kaplan iterated, is that which assumes
because students can write in their native languages, they
can also write in a second language. College-level NELB
students often fall prey to this fallacy and are evaluated
on native-English speaking standards. They are, as a
consequence, frequently penalized for poor form,
incoherence, or disorganization. While it may be true that
the papers of NELB students are lacking in these areas, it
is quite often due to the fact that these students are
operating under a rhetoric substantially different from that
of English. Problems of organization, coherence, and form
may be present in student writing despite the fact that
syntatic structure may be impeccable.

Besides the differences in logic systems, NELB students
are faced with other difficulties during writing in
English. Most obvious of these problems is that of
differences between the native language and English in the

areas of syntax, morphology, and vocabulary. Incomplete knowledge of the English language is responsible for many of the grammar, vocabulary, and spelling errors found in NELB writing. Additionally, differences in redundancy features of the two languages may cause problems (Rivers, 1980; Spolsky, 1980). As Ross (1976) pointed out, insights into these errors can be gained through a contrastive analysis of the two languages, but insight does not eliminate the errors automatically.

Another source of problems in NELB students' writing comes from the fact that they are often overpreoccupied with avoiding mistakes. According to Knepler (1984),

> many NELB students tend to feel that the first
> draft should be perfect. With this impossible
> goal, student writers tend to become very timid
> about putting ideas down on paper at all. Aware
> that the more words they write and the more
> chances they take in expressing original ideas,
> the more mistakes they will make, students tend to
> write as little and as conservatively as
> possible. At the same time, [the teacher's]
> emphasis on helping students find and correct
> their errors may push students into writing even
> less fluently, perhaps with little or no gain in
> accuracy. (p. 15)

A final problem witnessed in NELB student writing is that of orthography (Barnitz, 1982). Not only may the native symbol system differ from English, but also the direction of the flow of writing may be exactly opposite to that of English. For students for whom this is true, such as Arabic- or Chinese-speaking students, writing in English

is not only a difficult cognitive task, but also a difficult mechanical task. The poor handwriting which often results is sometimes mistaken for a lack of maturity or interest on the part of the student.

The problems outlined above that are frequently a part of NELB student writing are similar to the problems of the basic writers discussed by Shaughnessy in Errors and Expectations (1977). It should be noted that some of the subjects used in her analysis came from non-English language backgrounds. The fact that she did not analyze the data separately for native and nonnative speakers of English can be viewed as the major limitation of her work, for the problems in writing by someome using a dual language framework may be quite different from those of a monolingual writing in his or her native language. Despite these possible differences, it is interesting to note that Esau and Keene (1981) proposed using a TESOL (Teaching English to Speakers of Other Languages) model for teaching writing to English-speaking college students.

Whether NELB student problems in writing are similar to those of basic writers in English or not, it is clear that writing in a second language is different from writing in a first language. The questions of precisely how these two types of writing differ and in what way they differ have yet to be answered fully because research on NELB writing is at the beginning stages. Until these questions are answered,

researchers in the field must depend on findings from composing research using native speakers of English as subjects. These findings may or may not help partially explain the composing processes of NELB students; but they, nevertheless, provide researchers in the field with pertinent questions with which to approach the research task.

Research on NELB writing. According to Zamel (1976), little research has been done on the writing process of NELB students, and this has left teachers with the almost impossible task of deciding the approach and text to use. She also stated that for the most part research in related areas has also been ignored, and the consequence has been that those in the field have focused on approaches that have little to do with writing as a process. These approaches to teaching writing to NELB students run the gamut from demanding total control (using substitution, manipulation, and transformations of sentences and patterns) to free composition, where students write frequently. Although knowledge in the field of composition for native speakers of English is far from complete, research has answered some questions that can be used in the NELB classroom. First of all, reported Zamel, research has shown that mere frequency of writing is not enough to improve student writing; it may even have detrimental effects. Additionally, the study of grammar has been shown to have negligible or even negative

effects on writing. Taylor (1981) pointed out another practice frequently used in NELB classrooms that may stifle the writing process of students, namely outlining. Research on native English composition has shown that writing is a nonlinear process, Taylor further stated, that is characterized by a bi-directional movement between content and written form and that relies heavily on revision. Outlining in detail, he concluded, does not support this process of discovery.

Although not extensive, some research on the writing process of NELB writers has been carried out. This research and the literature in the field (Edelsky, 1982, 1983; Halsall, 1985; Hudelson, 1984; Spack & Sadow, 1983; Taylor, 1981; Zamel, 1976, 1982, 1983) show clearly that interest is shifting from the written product to the writing process. Perhaps this shift in interest reflects nothing but an imitation of research on native English composition; more likely it reflects a need to redefine goals and redirect pedagogy; i.e., it reflects an emerging new paradigm.

With the exception of the research reported by Zamel (1982, 1983), most research to date on NELB writing has focused on children learning to write in English. Findings from these studies will be discussed only briefly. While studies concerning the writing of children may provide insight into adult writing, there is a tremendous

developmental difference between children and adults that must necessarily affect the writing process.

Edelsky (1982) studied nine children and concluded that knowledge in the first language does not interfere with writing in another language; rather, it forms the basis of new hypotheses. Another analysis of the same data (Edelsky, 1983) revealed that unconventional segmentation used by bilingual children honored syntatic and phonological boundaries; and early invented punctuation focused on the line, word, or page and often involved separation. Hudelson (1984) added to this knowledge the information that the composing process of young bilingual children is surrounded by talk and focuses on important issues related to school. She also found use of unconventional segmentation and invented spellings. Finally, Halsall (1985) identified 12 composing behaviors observed during the composing processes of bilingual children: reading back, invented spellings, copying, body language, prewriting, concealed writing, writing play, and oral-language functioning which included confirmation questions, talking while writing, asking questions, statements about writing, and taking breaks. Clearly, from the work of these researchers a description of the writing process of bilingual children is beginning to emerge.

Zamel's (1982, 1983) work represents the first major attempt to systematically describe the writing processes of

adult NELB students who are proficient writers in English. In these case studies, Zamel found that students most skilled in writing undertook composing as a process of discovering and exploring ideas and constructing a framework into which to present these ideas. She discovered, as have researchers of native English-speaking composition, that writing for the more advanced NELB student is a generative, recursive, nonlinear, and exploratory process whereby writers discover and reformulate their ideas as they try to approximate intended meaning. This process of discovery included the writing of several drafts by most of the subjects; and although the majority of subjects made revisions basically at the lexical and syntatic level, a few of the subjects' reformulations included major global changes.

The information that Zamel (1982, 1983) provided about the writing processes of adult NELB students who are proficient writers in English is similar to that furnished by researchers in native English composition. It is, however, too soon to reach definitive conclusions, for evidence is far from complete. Zamel's work was done using her own students as subjects; and by her own account, Zamel is very much a process-oriented composition teacher. The information she reported, then, may describe the writing processes of only those proficient NELB writers writing in an environment where their processes are encouraged and

reinforced. It may not describe the writing processes of NELB students proficient in English writing but lacking a supportive environment or NELB students less proficient in English writing.

Summary

During approximately the last decade-and-a-half, the field of composition has been characterized by a shift in interest from the product of writing to the process of writing. This shift has resulted in increased understanding of writing as a process of discovery, and with this new understanding have come new ideas for teaching writing and innovative methodologies for research on the writing process. Despite these advances, however, many questions concerning the writing process remain unanswered, and in no area is this more evident than in that of NELB student writing. Only through evidence gathered by systematic research on the composition processes of various groups of writers will an accurate description of the writing process evolve, and only through the ensuing description will those in the field be able to formulate models of writing that reflect the complexity of the writing act. Without these models, the development of a composition paradigm is difficult, if not impossible. It behooves researchers in the field to complete the as yet unfinished description of the writing process so that pedagogy can be based on a complete understanding of the many variables that operate

when students write in English, be they native or nonnative speakers of English or proficient or basic writers.

Psychology

Introduction

Without a doubt psychology plays a critical, albeit poorly understood, role in the writing process. In fact, it could be said that psychology permeates the writing act on a multitude of levels. For example, the psychological makeup of an individual influences his or her writing process, and daily mood swings can be responsible for variance in individual writing. Equally, perception, encoding, short and long term memory, decoding, individual learning styles, intuition, neuropsychological factors, and psychomotor skills are at work during the writing process, and these also can be considered interests of the field of psychology. A field of study but about two decades old has evolved in an effort to understand the interaction between these cognitive operations and linguistic structures (Daiute, 1981); and research carried out in this field, known as psycholinguistics, has provided some insight into the writing process even though most research has centered on the production of oral language.

Perception

The major problem with understanding what goes on in the human brain is that the processes are not directly measurable; but, rather, they must be inferred from indirect

evidence. The fact, then, that there is no one commonly held theory of perception comes as no surprise. While there is disagreement among experts as to what factors are involved in perception, it is not the purpose of this discussion to outline these disagreements. Rather, it is to provide a general understanding of perception and to present information that may be used in guiding interpretation of research findings. The works of Paivio (1978) and Pick and Saltzman (1978) serve this purpose.

Paivio (1978) made the assumption that "two distinct symbolic systems are involved in perception, memory, language and thought" (p. 39). One of these systems is for processing nonverbal information and the other is for processing verbal information. Different categories of stimulus information result from crossing these two symbolic systems with different sensory modalities, and, thus, there is dual coding of information. Paivio suggested that the sensory and symbolic modalities may be orthogonal in the following manner:

Sensory Modality	Symbolic Modality	
	Verbal	Nonverbal
visual	printed words	pictures or objects
auditory	speech sounds	environmental sounds
tactual	braille	feelable objects
kinesthetic	motor feedback from writing	motor feedback from haptic exploration of objects

(p. 40)

As Paivio (1978) pointed out,

the relation of the approach to the environmental-
communicative distinction should be immediately
apparent: the nonverbal system is specialized for
representing and processing environmental
information, whereas the verbal system is by
definition specialized for communication.   (p. 40)

What should also be readily apparent is that some sensory

modalities are more closely connected with writing while

others are more closely connected with speaking.

Furthermore, according to Paivio, the verbal system is more

directly activated by spoken and written language while the

nonverbal system is more readily activated by nonlinguistic

stimuli.

By Paivio's (1978) own account this concept of dual

coding is in contrast to another popular contemporary view

which states that "both kinds of information are represented

in the same symbolic format in a common memory system"

(p. 43).   He indicated that the competing approach has

several difficulties, an important one being that it cannot

account for differences in memory reactions to pictures and

words.

Pick and Saltzman (1978) provided further insight into

what part perception may be playing in the writing process,

and their work represents yet another interpretation of how

information is perceived.   These authors discussed

perceptual modes and claimed that different modes of

perceiving may be implied (a) when a pattern of stimulation has the perceiver extract one type of information rather than another and (b) when very different patterns of stimulation have the perceiver extract a specific type of information. They defined perceptual mode in terms of the information extracted by the perceiver and stated that there is evidence that the same stimulation can be processed very differently "depending on whether information is extracted to monitor one's own state of actions, or whether the perceiver's purpose is to extract information about the environment" (p. 2). They used as an example spoken and written language. As they pointed out, written language is a representation of spoken language, but perception during reading is very different from perception of print as black-on-white. They asked whether or not these types of differences should be considered different perceptual modes. Other types of modal distinctions they proposed are speech versus nonspeech, auditory, visual-auditory orientation versus focused manipulative and identification functions, subjective versus objective perception, and social versus physical perception. They also postulated that there may be a specialization of function in the sense modalities and that perception is different when it serves the purpose of guiding activity than when it is used under more passive, or receptive, conditions. For example, they claimed that perception during one's own vocal production is

different from perception of a similar stimulus from another person. Finally, they discussed how modes of perceiving may be culturally influenced. As an example of this, they discussed the inability of Japanese to distinguish the sounds r and l in both production and perception of speech. If this problem were not culturally produced, one would find the same difficulty among Japanese raised exclusively in an English-speaking environment, but this difficulty is nonexistent among this group of individuals. Besides cultural differences, Pick and Saltzman postulated sex and age differences in perception.

The words of Pick and Saltzman (1978) perhaps best summarized their point of view concerning perception:

> At present we conceive of mode as involving an approach to behavior that recognizes the importance of the nonarbitrary relations between different types of information, perceiving,and acting. That is, an organism's behavior is viewed as being significantly determined or affected by different informational subsystems that predispose the organism to perceive and act upon a certain type of information in a characteristically distinct way from that used to perceive and act upon a different type of information. (pp. 10-11)

The works of Paivio (1978) and Pick and Saltzman (1978) serve as a guide in attempting to understand what factors influence perception and how a stimulus can evoke different types of perception. The exact role that perception plays in writing is not known, however, and is even less

understood when that writing is being done on a medium that itself may affect perception, namely the computer.

Intuition

In the discussion on language acquisition, it was shown that children acquire language via unconscious processes given the appropriate input at critical periods. Most of the language learned as a child becomes intuitive, and no formal training is needed to know when something does or does not "sound right" to a native speaker of a language. Until recently it was thought that adult second language learners do not acquire language in the same manner as children but, rather, rely on conscious learning strategies. Evidence is beginning to surface, however, that indicates that adults may acquire language in much the same way as children do and have access to intuitions that may be used in making judgments about the appropriateness of some aspect of the second language. As Shaughnessy (1977) pointed out, these intuitions may not always turn out to be correct; nevertheless, they do seem to exist and only through increased understanding of the role that intuition plays in second language acquisition will those in the field be able to tap into those intuitive processes.

Work done by Krashen (1976, 1980, 1982) and Bailystok (1980, 1981) has provided insight into the role of intuition in second language learning. Despite the fact that the focus of these authors has been on spoken language,

applicability of their findings to written language can be inferred.

Krashen's monitor model of language acquisition (1976, 1980, 1982) was briefly discussed earlier in this review but will be summarized here again. According to this model, adults acquire language by two different methods, acquisition and learning. Unconscious processes are at work during acquisition and conscious strategies during learning. The consciously learned linguistic knowledge serves as a monitor for the acquired language, and monitoring usually takes place just prior to language production. Second language learners with a highly developed monitor may be able to outperform their acquired competence given the proper conditions and enough time. Nevertheless, it is this acquired competence that allows the learner to produce language. It is also this acquired language that is at work when a student cannot tell you a rule but knows that she or he has produced a correct answer, when something "feels" or "sounds" right to the student.

Bialystok's (1980, 1981) model of explicit and implicit linguistic knowledge is not unlike Krashen's (1976, 1980, 1982) model. In Bialystok's (1980) model, explicit linguistic knowledge is that knowledge pertaining to conscious facts that can be articulated, and implicit linguistic knowledge is the "intuitive information upon

which the language learner operates in order to produce responses (comprehension or production) in the target language" (p. 201). Implicit linguistic knowledge is both spontaneous and automatic, and it is this knowledge at work when the language learner claims that a sentence "feels" or "sounds" correct. Explicit linguistic knowledge, then, can be equated to Krashen's learned knowledge while implicit linguistic knowledge can be equated to acquired knowledge.

Using the models of Krashen and Bialystok as a framework, Gass (1983) tested the function of grammaticality, or intuitional, judgments in second language acquisition, specifically in written English. Her study included 21 subjects who were given an in-class composition to write. There was ample time given both for writing and correcting the errors in the composition. The next day students were asked to give a grammaticality judgment on sentences from four categories: grammatical sentences from their own compositions, ungrammatical sentences from their own compositions, grammatical sentences from other students' compositions, and ungrammatical sentences from compositions of other students. The subjects were asked to identify the sentences as "good English sentences" or "bad English sentences." The following results were obtained:

1. Intermediate students judged more of their own sentences grammatical than did advanced learners.

2.   Intermediate students recognized better their own grammatical sentences than their own ungrammatical ones whereas advanced learners were about equal in this area.

3.   After changes to the sentences were made, grammatical sentences remained grammatical while ungrammatical sentences remained ungrammatical.

Gass's (1983) conclusion was that learners seem to have

what in German might be called Gefuhl, "feel,"
. . . for the grammaticality of a sentence as a whole even though they cannot articulate precisely, nor even recognize, where or what the trouble area is. (p. 285)

Additionally, she concluded that with increased proficiency in the second language does not come an increased feel for the language but, rather, an increased capability of pinpointing the trouble area and recognizing what specifically is wrong, i.e., increased analytical ability. This analytical ability could be paralleled to Krashen's learned knowledge and Bialystok's explicit linguistic knowledge.

In short, it appears that intuitive processes play a role in second language learning that may be much more important than previously understood. By understanding these intuitive processes, one can better understand the nature of second language acquisition, thereby clearing the way for improved pedagogical practices.

Sensory Modalities

The term "modality" is used in various ways in the literature, but here it shall refer to the sensory means by which a stimulus is perceived. This discussion will center primarily on the visual and auditory modalities and their relationship to writing, but it has been shown that other senses may play a role in the writing process (e.g., King, 1980).

Literature on second language learning reflects the importance of the senses in the language classroom. For example, Thiel (1980) discussed the importance of the five senses in receiving information about the environment, particularly in a language classroom, and Asher's (1966, 1969a, 1969b) total physical response approach to second language learning has at its core responding to language through the senses. Additionally, the purpose behind the use of invisible writing (Blau, 1983; Gould, 1980; Marcus & Blau, 1983) is to deprive the writer of the visual modality in order to make writing a thinking process. Finally, the talk-write model of writing (Radcliffe, 1972), the use of verbal protocols (Flower & Hayes, 1977, 1980, 1981), and the concern with oral language in writing (e.g., Dyson, 1983) indicate that writing and the auditory mode are somehow connected.

How sensory modalities are tied to language learning is not clearly understood, but several authors provide some

insight into their function. Briggs (1968) reviewed the
literature on modality and concluded that there may be an
interaction of modality with other factors such as age and
intelligence, that the previously held notion of the
superiority of simultaneous auditory and visual stimuli had
fallen into disrepute, and that different situations call
for the use of different modalities. In a study by Cooper
and Gaeth (1967) there was evidence of an interaction
between modality and grade level, and the researchers
concluded that with meaningful material a preference for one
modality (visual or auditory) over another is a function of
habit. Edling (1968) called for the need for further
studies on the use of single or multiple modalities, and
researchers in the field of reading responded to this call,
accumulating a vast store of knowledge about the role of
sensory modalities in reading (e.g., Silverston & Deichmann,
1975). We are just beginning to acknowledge, however, that
modalities may play a critical role in areas other than
reading.

Emig discussed the way in which the hand, eye, and
brain work together in the writing process (Emig, 1978;
Rosen, 1979). The hand, according to Emig, serves a special
function in writing for some people, and this function seems
to be tactic. For some writers, notably Hemingway, the
first draft of a piece of work must be done by hand. There
are, continued Emig, at least four possible reasons for

this:

1.   The act of writing is activating, physically propelling the writer from inactivity into activity.

2.   Writing may be for some people an aesthetically necessary part of composing.

3.   Writing, which is linear in English, may in some way reinforce the work of the brain's left hemisphere, which also functions in a linear fashion.

4.   Writing by hand slows down the writing process, thereby allowing more time for thinking.

Emig (1978) proposed three functions of the eye in writing:

1.   During prewriting the eye is most likely the sense modality that presents experience to the brain.

2.   During writing the eye coordinates activity between the brain and the hand.

3.   During reformulation the eye is the major sense modality to review and rescan.

The fact that some people are incapable of writing via a tape recorder or dictating machine attests to the fact that the eyes are a predominant modality during the writing process.   This may be due in part, however, to the fact that the auditory mode is not trained as well as the visual mode.

As Monod-Cassidy (1966) pointed out, we do not train the senses equally; we are almost exclusively a sight-oriented society.   This orientation influences the way in

which languages are taught, particularly to adults, and this
orientation may place some students at a disadvantage. If,
for example, a student has a preference for visual modality
and is being taught by the audiolingual method, learning may
be adversely affected. Likewise, if students are prohibited
from vocalizing during writing class, they may be cut off
from a sensory experience necessary for their writing
process. It is, therefore, important to understand what
part the various senses play in the learning process and
build our pedagogy around tapping into these modalities.

Sociology

That writing involves a process of discovery has been
demonstrated in the section of this literature review on
composition. This process of discovery engages the writer
in not only a lingusitic act, but also an act of self-
exploration. For both the native and nonnative speaker of
English, this self-exploration is influenced by the culture
in which the student was raised, for culture is an integral
part of every person. When students are writing for
audiences from within the same culture, common meanings are
shared and understanding is thus facilitated; however, when
the audience, which is often the teacher, comes from a
different cultural background than the writer, the meaning
expressed in the writing may be interpreted in different
cultural terms, resulting in a breakdown of communication.
The NELB student, then, besides struggling against

linguistic and rhetorical problems, must also struggle to write in such a way that the meaning of the product matches the target language's cultural expectations. The way culture affects writing will now be examined.

Levinger (1978) wrote that

the qualities of environment and response so essential to the natural development of the human specie are not just required in infancy, but throughout life. The human being is forever in developmental and learning situations; what changes is his capacity to deal with trauma. (p. 27)

What often happens is that the adult represses the authentic voice, the origin of writing, and becomes unwilling to speak and write or uses false voice. This false voice is an imitation of someone else and is used to avoid trauma or being misunderstood. The poor writing student, concluded Levinger, may have experienced trauma at some point in his or her life in efforts to communicate and thus turned off attempts at using authentic voice. Use of false voice may also account for some of the writing problems of NELB students, for attempting to write for another cultural audience may necessitate the using of a voice which is neither authentic nor meaningful to the student. Reiss (1981), Rubin (1975), and Stern (1980) have shown that the willingness to use language in real situations and to attend to meaning are the marks of good language learners, so the

use of a false voice in writing should be of real concern to the writing teacher.

King (1984) indicated that absence of real communication in the classroom may result in students' failure in school. As she argued, one's ability to write or comprehend verbal material goes beyond mere skill in encoding and decoding auditory and visual materials; it involves also the writer's or speaker's purpose, knowledge, and sensitivity to audience. Furthermore, King continued, there is a unique triangle of relationships among readers, writers, and the meaning to be shared. Each person has "his or her own relationship to the content, influenced by background of experiences and inner world of thought, feelings, and attitudes. Individuals view the world differently" (King, 1984, p. 177). This is particularly true if the reader and writer are from different cultural backgrounds.

Winfield and Barnes-Felfeli (1982) conducted a study to examine the effects of contextually familiar and unfamiliar material on the writing of NELB adults. Of particular interest in this study was whether or not familiar material improved fluency, grammaticality, or complexity of sentences. Results indicated that the use of familiar topics improved fluency and grammaticality. It was difficult to interpret results in terms of complexity of sentences, but there was also some evidence that sentences

became more complex during writing on a familiar topic. This study, then, illustrated how closely culture is tied to the writing process and to the learning process in general (Cooper, 1980; Zampogna, Gentile, Papalia, & Silber, 1976).

Cronnell (1983) suggested that the best way to teach writing to linguistically different students "may be an eclectic one that incorporates a variety of approaches that may work with a variety of students" (p. 62). The communicative language teaching approach (Nattinger, 1984; Taylor, 1982), which is gaining popularity in the NELB classroom, is just such an eclectic approach. At the core of this approach lies the philosophy that second language learners acquire language better in naturalistic settings where meaning and function are more important than form and where the emphasis is on not only the cognitive needs of students, but also the emotional ones. Language in these classrooms is communicative and meaning is something which emerges and is negotiated, not something which is imposed by the dominant culture. In light of the evidence presented above, the new focus on meaning and real communication in the NELB classroom should have an important impact on not only the writing process, but also the communicative process in general.

<div align="center">Computer Technology</div>

Introduction

For nearly two decades technology has been changing the way people write; so the immediate question is not whether

to embrace this technology but, rather, to understand how it is most likely to affect the composing processes of students (Halpern & Liggett, 1984). For no group is this understanding more critical than that of non-English language background students, for pedagogy in the field of NELB composition is undergoing a paradigm shift away from viewing writing as a linear set of skills that produces a product toward viewing it as a nonlinear process. Because of this shift, answers are needed to questions concerning not only the composing processes of NELB students, but also the means by which these processes can be facilitated, including technological means.

The technological instrument of most interest to educators today is the microcomputer. Despite the ubiquitous nature of this device within the schools, the plethora of literature in which its usefulness for instructional purposes and its role in education are debated (e.g., Bell, 1983a, 1983b; F. Fisher, 1982; Forman, 1982; Grayson, 1984; Phi Delta Kappa, 1984; Willis, 1979; Wresch, 1983; Zoller, 1974), and the studies carried out on its effectiveness in increasing achievement (e.g., Carter, 1984; G. Fisher, 1983; Kulik, Bangert, & Williams, 1983; Kulik, Kulik, & Cohen, 1980), there is still no clear-cut answer concerning the role the microcomputer should play in education. Part of the problem in ascertaining the role of microcomputers in education is that researchers have been

unable to identify exactly how computers affect learning; and until it is known how learning may be affected by this tool, it is difficult to determine its appropriate uses. Another part of the problem, however, is that an avalanche of computer hardware and software hit the education profession before it was prepared and knowledgeable enough to deal with it. The first response to this premature inundation was one of groping and confusion, but at present there is enough information and computer sophistication to begin asking the appropriate question: Given this powerful tool, how can its capabilities be used to improve upon and maximize the instructional process? In the field of composition it appears that word processing via a microcomputer is surfacing as a potential boon to the writing process.

In the final section of this literature review (a) word processing and its role in the writing classroom, (b) the literature on voice synthesization, and (c) the use of computers with NELB students will be discussed.

Word Processing in the Writing Class

According to Withey (1983) two conditions are changing the way writing is being taught: the changing emphasis from written product to the writing process and the advent of the microcomputer. These two conditions may seem only remotely connected, but they are in fact highly complementary, with the microcomputer serving as a tool that may aid the writing

process. That teachers of writing have found the microcomputer useful in facilitating the writing process can be evidenced in the many articles acclaiming its value in the elementary, secondary, and college English classroom (e.g., Bruce, Michaels, & Watson-Gegeo, 1985; Cory, 1983; Emmett, 1984; Hennings, 1983; Levin & Boruta, 1983; Liebling, 1984; Moran, 1983; O'Brien, 1984; Papert, 1980; Schantz, 1983; H. Schwartz, 1983; L. Schwartz, 1983; M. Schwartz, 1982; Willer, 1984; Withey, 1983). What is it about the microcomputer that makes it appear a useful tool in the writing classroom? This question can best be answered by showing how microcomputers can serve as a tool in the writing process and by describing research findings on the use of word processing for composing.

There are generally three parts considered necessary for maximizing the potential of a microcomputer: the terminal, the monitor, and the disk drive(s). These three parts are called "hardware," and they are often supplemented by other types of hardware, such as printers. In brief, the terminal acts like the "brain" of the microcomputer and is the part of the microcomputer where the keyboard is found, the monitor serves as a screen for seeing both input and output into the terminal and looks much like a television screen, and the disk drives allow the user to store information and use information from sources outside the hardware. This outside information is known as software,

and it often takes the form of games, tutorials, and lessons. A word processor is a type of software that works in conjunction with a microcomputer; and when word processing is being used, the microcomputer serves only as a tool.

Research has been done on using the microcomputer as a device for teaching different skills used in writing (Bruce, Michaels, & Watson-Gegeo, 1985; Dudley-Marling, 1985; Levin & Doyle, 1983; Lund, 1983; Selfe, 1983; Suttles, 1983; Wresch, 1982); but the focus of interest in computers in the writing classroom has been primarily on the use of word processing to facilitate the writing process. Although word processing software varies from package to package, all word processing software allows the user certain basic capabilities. The most important of these capabilities are (a) insertion of text on a blank screen; (b) easy deletion of letters, words, or paragraphs from the text; (c) easy movement of some parts of the text to other positions within the document; (d) insertion of new text at any place within the document; (e) saving the document onto a diskette; (f) retrieval of the document in order to work on it again; and (g) printing one or many copies of the document onto a piece of paper.

These capabilities allow the user to write, edit, revise, rewrite, and print a neat copy of the document with an ease and speed not possible before. If Papert's (1980)

prophecy is correct, the word processor may become the pen of tomorrow, and its influence on children, adults, and those with writing handicaps (Geoffrion, 1982-83) could be dramatic. How much it influences writing, however, and in what ways, depends on how well we understand its potentials and its dangers (M. Schwartz, 1982).

Perhaps the greatest potential of the word processor is that it can allow the writer to focus upon revision as an integral part of the writing process. The student need no longer view the first or second draft as the finished product because producing many drafts using a word processor is potentially less time-consuming than producing one draft by hand. By freeing the student to focus on revision, then, the word processor takes the pressure off him or her to produce an error-free draft on the first try. As shown previously, preoccupation with errors is a problem frequently found among basic writers, including NELB students, and word processing offers these students the poossibility of leaving this preoccupation behind. For word processing to fulfill its promise in this area, however, the role of revision in the writing classroom must change. As Mimi Schwartz (1982) indicated, revision must cease to serve the role of punishment and begin to be considered an essential part of the composing process. The word processor complements this new role by

> reducing the frustrations of recopying, by
> facilitating reading of the text during the
> intermediate writing stages--both for the writer
> and other readers--and by reproducing multiple
> drafts of this text for easy sharing with faculty
> and peers during the intermediate writing
> stages. As a result, the writer gains new
> confidence, energy, and information needed to
> explore new meanings without feeling that there is
> a penalty for trying. (p. 28)

Schwartz's conclusion was that there are important potential

results, particularly for writers who lack skill and

confidence. The potential results are that the fear of

making errors will be reduced and that exploration of

meaning will be encouraged.

Moran (1983) pointed out several more potentials and

problems that may result from the use of word processing in

the writing process. First, Moran agreed with Schwartz that

word processing allows the focus of writing to switch to

revision; but, as he argued, the process of revision is

poorly understood, and to realize the full potential of

revision, it must be more clearly understood itself. More

research on the revision process is therefore needed in

order to understand how best to tap into the potential of

the word processor in the revision process. Secondly, Moran

expressed fear that there will be an increasing dependency

on the word processor and accompanying programs that check

both the spelling and punctuation used by the writer for

errors. Moran's contention was that this dependence on

technology cannot be entirely good, for without the aid of

these helpers students will not know how to write. Use of these aids does not imply ignorance of spelling or punctuation rules, however. One must be quite knowledgeable in order to use them properly. For example, a spelling checker does not find a misspelled word and correct it automatically. Rather, it matches words to a "dictionary" within its memory and if a match is not found for a word, it stops on that word. To correct the word, one must first know if it is misspelled. This implies a knowledge of spelling or, at least, the ability to look up a word in the dictionary. Many people must write with a dictionary close at hand, so having this aid is seen as no more dangerous than having access to a dictionary or thesaurus. Caution about relying too heavily on technology must be exercised, but finding problems with technology that in reality do not exist also presents a problem.

Writing by word processor has yet another characteristic which makes its potential unique. As stated by O'Brien (1984), people who use a word processor find that they brainstorm ideas at the keyboard from the very beginning, with the blinking cursor luring them into the writing process. There is, as any user of a word processor will confirm, something alluring about the contrast of colors and blinking cursor that invites the user to become absorbed in the writing process. O'Brien argued that writing by word processor may be qualitatively different

from writing by other means because the writer becomes separated from the words on the screen and the words take on a separate existence. This distancing from the work, according to O'Brien, is what is sought by all artists and is integral to the creative process.

Several studies have been carried out, both formally and informally, to test the idea that word processing aids the writing process. In an informal study conducted by Engberg (1983), word processing was shown to sustain student interest in revising and increase the amount written by students. Students who had traditionally had difficulty beginning the writing and who agonized over every word were those most affected by word processing. Suddenly these students began to produce faster, write more, and feel freer to experiment with their writing.

The use of word processing has also been found to have positive effects on both attitudes and writing of elementary children (Levin & Boruta, 1983; Willer, 1984) and college students (Halpern & Liggett, 1984), but it is interesting to note that in all these studies word processing was shown to be effective within the milieu of a positive writing environment where the focus was upon the writing process. This is equally true of the research carried out by Curtiss (1984). Unlike in the other studies, however, Curtiss found that the word processor is not a tool preferred by all students. The writing process of some students, he

reported, was actually inhibited by word processing. His interpretation was much the same as that of Emig (1978), that perhaps for some people the use of a pen is necessary for deliberately slowing down the writing process.

Studies by Daiute (1986), Harris (1985), and Hawisher (1987) have also produced somewhat negative findings concerning the value of using word processing in the writing process. These three researchers examined the effects of using word processing on the revision strategies of writers and found that students actually revised less when writing by word processor than when writing by paper and pen.

Because very little research has been done on the use of word processing in the composing process, it is too early to draw conclusions concerning how the use of a word processor as a tool facilitates or retards the writing process. It is the task of those in the field to understand how word processing affects writing, in what ways it affects writing, for which groups it has positive application in the composition classroom, and in what milieu it best works.

Voice Synthesization

Speech synthesis is not a new phenomenon, but it is just beginning to come within an affordable price range. With inexpensive voice synthesizers such as the Echo (Street Electronics), Type 'n Talk (Votrax), Intex-Talker (Micro Systems Corporation), and Terminal Emulator II (Texas Instruments), electronic speech is simple and easy to have

as a supplement to a microcomputer system. Interestingly,
however, "the greatest majority of current microcomputers
used in the schools do not make use of the inherent power of
spoken language to facilitate learning" (Ginther, 1983,
p. 105). Microcomputers, for the most part, have been
silent partners in the learning act; but, as it will be
shown later, educators are beginning to realize the
potential for voice synthesization and integrating it into
computer learning. The combination of speech synthesis and
computer, as Ginther pointed out, presents an interesting
and possibly very useful interactive learning device, but
there is much work to be done in determining its appropriate
uses.

One of the most important questions surrounding the use
of voice synthesization is the quality of the voice
produced. By understanding how this voice is produced,
perhaps its potential problems can be better understood.
McComb (1982) has provided a succinct explanation of
technical aspects of voice synthesis, and the present
discussion will draw heavily from his explanation.

As McComb (1982) summarized, in the simplest form voice
synthesis involves a conversion of digital information to
speech which is recognizable. In reality the process is
much more complicated. A voice synthesizer must recreate as
closely as possible sounds produced by the human tongue,
lips, mouth, vocal cords, and lungs, and it does so via

sound and noise generators, filters, timers, and delay
circuits. As one types on the keyboard, the words are sent
to a translator, a well-defined set of pronunciation rules,
and these signals are modified and sent to the
synthesizer. The speech synthesizer uses various and
periodic sound generators to create human-like speech and
passes it through a converter where it is amplified and fed
to the speaker. The speaker amplifies this converted voice,
and thus the sound is produced.

The pronunciation rules governing the translation from
keyboard signals to speech, continued McComb, are based upon
either phonemes (basic units of sound, such as p or t) or
allophones (variations of the phonemes, such as an aspirated
or unaspirated p). Most voice synthesizers on the market
use phoneme-governed pronunciation, but a few (e.g.,
Terminal Emulator II and Echo) are based upon allophone-
governed pronunciation, which produces a higher quality of
speech. As any reader or writer of English knows, however,
there is not always a direct translation from letter symbol
to pronunciation rule in the English language, and this
frequently results in a "mispronunciation" by the voice
synthesizer. McComb (1982) outlined a few ways to "bend the
rules" in order to make the pronunciation come out better.
The most basic of these ways is to misspell the word; for
example, the b could be left off the word "comb." Another
possibility is to split words to help in the pronunciation.

Cumming and McCorriston (1981) conducted a study to determine if imperfect speech produced by the voice synthesizer was adequate for the demanding task of supporting reading skills of young children. Children were asked to identify initial and final speech sounds produced by a human voice, a voice synthesizer commonly used with microcomputers (Supertalker), and Codec (hardware developed for the telephone system). Children had a mean average correct score of 86.6% for human speech, 78.2% for voice synthesizer via microcomputer, and 84.4% for Codec. The researchers concluded that voice synthesization via a microcomputer is not intelligible enough to meet the demands for reading practice with young children; for unlike adults, children are inexperienced and need the fine details of the message.

Other researchers, as reported by Friedman (1983), have concluded that in speech comprehension the brain works at about one-half its capacity for assimilation. Part of the reason for this is that the brain can assimilate information at a much faster pace than the human voice can produce it. Speech compression experiments have shown that people can comprehend the same amount of material in approximately half the time with no loss of meaning. This type of research, then, illustrates that perhaps experiments of the sort done by Cumming and McCorriston (1981) are so narrow in scope that they do not tap into human capability for speech

comprehension. Nevertheless, both of these works provide food for thought and a stepping stone for further research on voice synthesization.

Without a store of research on voice synthesization, its uses must be implied. It is clear, for example, that there are direct implications for use of this technology with the verbally and visually handicapped. A blind college professor (Rogers, 1983), for example, reported that for him the voice synthesizer that works in conjunction with his word processor is a "godsend." The writing that was so laborious previously because of his visual handicap began to flow from his computer using the combination word processor/voice synthesizer.

There are also potential applications of voice synthesization with students who are not visually or verbally handicapped, but these applications have not been tested and, therefore, should be considered tentative. Ginther (1983) outlined some possible implications of using voice synthesization:

1. Young children can learn to use the computer quickly even though they cannot read.

2. Children can compare the phonetic pronunciation of letters with the symbols.

3. Older children can be provided oral instructions along with visual ones.

4. Nonreaders can use the computer.

5. Auditory information can supplement and reinforce visual information.

To this list should be added the potential of providing feedback to all students in two different sensory modes. If students have a preference for one mode over another, this dual sensory feedback allows for both modes to be equally utilized. This possibility is seen by some people (e.g., Becker, 1982; Ross & Campbell, 1983) as one of the greatest promises of microcomputer technology.

The possibilities and promises of voice synthesization, in summary, are there. It is the responsibility and obligation of the academic community to determine the feasibility and application of this technology for the classroom.

Computers and the Non-English Language Background Student

In 1983 more than half of the applications submitted under the Title VII Bilingual Education Demonstration Projects program included plans to use microcomputers with non-English language background students (Ryan, 1983-1984). Funding for these projects increased considerably from 1982 to 1984 whereas funding for other types of audiovisual technology showed a decrease (COMSIS, 1984). It appears, then, that whether or not to embrace this technology in the NELB classroom is as moot a point as it is for the regular classroom. Additionally, it seems

that the concerns and questions about microcomputer technology use with NELB students are much the same as they are for other students. The role the computer should play in the classroom, how it can best be utilized, and what criteria should be used for judging the appropriateness of software are concerns of NELB educators (COMSIS, 1984; Cubillos, 1983-1984; Cuevas, 1983-1984) as well as other educators.

A few researchers have examined the role of the microcomputer in the NELB classroom. These studies will be discussed briefly below.

In a study conducted by Saracho (1982), achievement in basic skills of Spanish-speaking migrant chldren was significantly improved through the use of computer-assisted instruction. Basically, the microcomputer acted as a teaching device to individualize instruction for these subjects, and individualization of instruction is both a necessity for NELB students and a major capability of the microcomputer. Results of this study indicated that the microcomputer holds great potential, as yet not fully realized because of the software quality, for individualizing instruction in the NELB classroom. Interestingly enough, however, students in the treatment group in this study had a more negative attitude toward computer-assisted instruction than did students in the control group. This finding was interesting in that the

majority of researchers studying computer-assisted
instruction have found that students hold a favorable
attitude toward the use of computers. Saracho interpreted
this as meaning either that learning styles play a critical
role in computer-assisted instruction or students in the
treatment group viewed the use of the computer as
"remedial," thereby lowering their opinion of it. This
finding was in contrast to that of COMSIS (1984).
Researchers from COMSIS found that NELB students in
computer-based projects had better attendance and considered
the use of computers motivating. Both Saracho and COMSIS,
however, reported increased academic improvement resulting
from the use of computers to personalize instruction,
allowing students to work at their own speed in a
nonthreatening environment.

Another COMSIS (1984) finding of interest was that in
one project NELB students from kindergarten to 12th grade
were taught to use word processing and then were made
responsible for producing a weekly school newspaper. In
other projects where computers were located in classrooms,
students used the computers in such creative activity as
story writing. These two findings point to the
applicability of word processing in the NELB classroom.

One of the most critical problems with using
microcomputers in the NELB classroom, as reported by COMSIS
(1984), Cubillos (1983-1984), and Cuevas (1983-1984), is the

lack of good quality software for use with NELB students. This problem must be resolved before it can be determined what effect the computer is having on student learning. Though there are certainly other criteria, Cubillos stated the most important qualities NELB student software should have:

1.   It should, as the minimum requirement, match the curriculum content.

2.   To accommodate varying learning styles, it should include visuals, sounds such as bells, synthesized voice in both the target and native languages, and a mechanism that allows the user to switch off and on these elements.

Clearly, these criteria are multisensory, indicating that in the NELB classroom the use of a variety of stimuli is critical for learning.

Summary

Emphasis in the field of composition has been shifting from the written product to the writing process; and with this shift of interest has come an increased understanding of the interdisciplinary nature of the writing act. Writing is not just a simple skill to be taught; rather, it is a complex linguistic, psychological, sociological, and mechanical act that is comprised of many and diverse variables.

This review of the literature served the purpose of drawing together from the fields of linguistics, psychology,

sociology, composition, and computer technology vital information that could be used for understanding writing as a multifaceted cognitive process that is influenced by extraneous variables and helping to answer the following specific research questions:

1.   What visual and aural behaviors are used by the subjects when writing utilizing the traditional paper and pen method?

2.   What function(s) do these visual and aural behaviors have in the writing process?

3.   Does writing by word processor change the nature or frequency of these visual and aural behaviors?

4.   Does aural feedback provided by a voice synthesizer reinforce or enhance visual feedback during writing?

5.   Is the written product affected by a change in the writing medium?

6.   What is subject reaction to using a computer as the tool in the writing process?

In the following chapter, Chapter III, the procedures used in the collection and analysis of data to answer these research questions will be outlined.

CHAPTER III
METHODOLOGY

Introduction

In Chapter II it was shown that Thomas Kuhn's (1970)
discussion of scientific revolutions has proven valuable in
helping those in the field of composition describe the
present condition of writing theory, research, and
pedagogy.   Interest in Kuhn's explanation, however, is not
limited to the field of composition; rather, it is witnessed
throughout the profession of education and social
sciences.   When one considers that Kuhn was describing
"pure" science and not social science, this interest has an
important implication; that is, that social scientists are
tempted by the successes of "natural" sciences and are
attempting to establish a mature-science paradigm (Connors,
1983).   What has increasingly become obvious, however, is
that "we cannot achieve scientific status for our discipline
merely by imitating scientific research techniques"
(Connors, 1983, p. 18).   Researchers in the social sciences
are becoming more and more aware that scientific research
methodologies do not always provide answers to questions
concerning human behavior, for human activity is often too
complex and research problems too multifaceted to be studied

in the manner that characterizes scientific research.   In
response to this awareness, social science researchers have
begun to employ research methodologies that match the rich
complexity of human behavior.

     The newly emerging paradigm of the writing process has
demanded new research methodologies to study this process,
and researchers have responded to this demand in innovative
and varied ways.   Humes (1983) enumerated the most important
of these methodologies: case studies, naturalistic studies,
quasi-product studies, and unique procedures.   Some of the
procedures used in the case studies included observation of
the writer while writing, guided interviews with the writers
to stimulate memory about the processes observed during
writing, timing writing behavior, and verbal protocols.   In
the naturalistic studies, most of the investigators used
participant observation in a natural environment.
Researchers doing quasi-product studies looked mostly at the
revising process and analyzed different drafts of a written
product produced by the subjects.   Unique procedures
included invisible writing and use of an electroencephalograph
to scan brain activity during writing.

     Despite the fact that none of these methodologies is
considered classical experimental research, important
information about the writing process has been uncovered
using these procedures, and results "have already modified
the established, scholarly view of the composing process"

(Humes, 1983, p. 205). What this research has shown are patterns that appear consistently across research projects, and these patterns are beginning to help researchers and teachers understand the writing process. As Humes pointed out, however, in order to

> help all writers become good writers, researchers
> from many methodologies must continue to
> investigate the composing process, for only by
> using a variety of techniques can researchers
> explore the various facets of this complex
> behavior. (p. 214)

The importance of also using a variety of techniques in research on bilingual education has been emphasized by Paulston (1982). By her account, the shift from quantitative to qualitative research is the most important development in bilingual education in the last 10 years because qualitative research allows the researcher to uncover important information about bilingualism that is unavailable when data are quantified. What Paulston forsaw for the future in research on bilingualism is a merging of qualitative and quantitative methodologies that provide both knowledge and understanding of all aspects of bilingualism.

The present research was focused on variables at work in the writing process of a group of bilingual adults and, thus, was concerned with two areas that have been shown to be amenable to and dependent upon a variety of research methodologies. This researcher, in an eclectic manner, drew

upon both quantitative and qualitative approaches that have
been used in collecting and analyzing data on the writing
process and on bilingualism. Detailed in the remainder of
this chapter will be the methodology that was used in
answering the following research questions:

1. What visual and aural behaviors are used by the
subjects when writing utilizing the traditional paper and
pen method?

2. What function(s) do these visual and aural
behaviors have in the writing process?

3. Does writing by word processor change the nature or
frequency of these visual and aural behaviors?

4. Does aural feedback provided by a voice synthesizer
reinforce or enhance visual feedback during writing?

5. Is the written product affected by a change in the
writing medium?

6. What is subject reaction to using a computer as the
tool in the writing process?

<center>Data Collection</center>

<u>Case Study</u>

Janet Emig (1971) first demonstrated the effectiveness
of using a case study design for studying the writing
process, and many subsequent studies of writing have
followed her example. Though findings of case studies are
not generalizable or predictable to other situations or
groups, the accumulation of findings offered by individual

case studies has allowed those in the field to begin to understand what variables are at work when one sets about the task of writing and, as a consequence, to formulate more pointed research questions; that is, case studies have proven valuable for theory building about the process of writing.

Despite the information that case studies, as well as other types of studies, have provided about the writing process, many basic questions about this process remain unanswered; and when large gaps in knowledge exist, the case study provides a useful and valid way of understanding the complexity of a phenomenon.

The objective of this study was to understand a complex set of variables at work in the writing process; and because little was known about the writing process of the group from which the subjects were drawn and the variables under study, the case study methodology was selected for examination of the problem. It was decided that only through an in-depth examination of the variables under study could insight be gleaned about their role in the writing process and further questions for research formulated.

Replication

Research on the writing process of individuals and small groups has provided information on the variables at work during composing, and it has shown those in the field that patterns in the writing process cut across research

projects. This duplication of research findings has allowed for certain generalizations about the writing process to be made that could not have been made based upon a single case study.

This researcher used replication of a case study as a means to determine if any patterns in the variables under study could be found across individuals. Though patterns found did not allow for a generalizability of the findings to the population at large, they strengthened the validity of the study and suggested that the findings may be applicable to a group larger than the one participating in the research.

Subjects

An important component of this research was multiple observations of the subjects during the entire writing process; therefore, it was important that all participants be disposed to invest considerable time on the research project. It was for this reason that self-selection was used to obtain research subjects. From a pool of potential volunteers, three of four research subjects were selected on the basis of the following criteria:

1.   They had keyboard skills (i.e., they knew how to type without looking at the keyboard) but had never used word processing.

2.   They came from a non-English language background.

3. They were at an intermediate level proficiency in English; i.e., they had obtained at minimum the Cambridge First Certificate of English (British standard) or scored at around 500 on the Test of English as a Foreign Language (United States standard).

4. They were unskilled in writing in English.

A fourth subject was selected using all the criteria above except the first one. This subject wrote all nine essays by the traditional paper and pen method, thereby allowing the researcher to examine what part practice was playing in the behaviors under observation.

All subjects were assigned code names for easy identification and to protect their identity.

Site

Because of the nature of the variables under study, a laboratory setting was used for the collection of data. The objects in this laboratory setting remained constant throughout the research project and included (a) a table used for writing by paper and pen with a chair on both sides of the table, one for the subject and one for the observer; (b) a file cabinet; and (c) a desk with a microcomputer and printer sitting on it and two chairs in front of it. The subject and the researcher worked alone in this setting and precautions were taken to preserve a quite, nonthreatening, positive writing environment in which the subjects felt comfortable.

Procedure

Data collection was divided into three distinct phases. These phases were characterized by the writing of three essays using different mediums of writing. The procedure in each phase is described below.

Phase One. All four subjects were assigned three separate writing tasks during this phase and asked to compose utilizing the traditional paper and pen method. Subjects were given special paper for writing that had been prepared by the researcher in advance. This paper had numbered lines that allowed the researcher to record observations with reference to where the behavior occurred during the writing of an essay. Having a record of where the behavior occurred during writing allowed the researcher to place the behavior within the context of the entire writing process and determine what function it played in the process.

The data collected during this phase of research were treated as baseline data which could be used for comparison with the other two phases.

Phase Two. Three of the four subjects were taught to use the Word-Talk (TM) word processing program developed for the Apple IIe (TM) by Computer Aids Corporation in Fort Wayne, Indiana. This word processing package was used as the writing medium for these subjects during the three sessions that comprised Phase Two. The fourth subject,

however, continued to write her essays by hand on the numbered, lined paper.

      <u>Phase Three</u>. The same subjects using word processing in Phase Two were taught to use the Echo Plus voice synthesizer that works in conjunction with the Word-Talk word processing program. These subjects, after instruction on use of the voice synthesizer, were told to use the voice synthesizer as little or as much as they wanted in the writing of the next three essays, those of Phase Three. The fourth subject wrote the three essays in this phase utilizing the traditional paper and pen method on numbered, lined paper.

Writing Tasks

      Whether or not the writing tasks are school-sponsored or self-sponsored has been observed to be an important variable in the writing process. Since this variable was not of interest in this study, the researcher held the variable constant over the research project; that is, all subjects wrote on topics assigned by the researcher. The researcher selected topics that required no special knowledge and that were potentially equally meaningful to all four subjects.

      Type of discourse has also been observed to be an important variable in the writing process; but, again, this variable was not under study in this research, and the investigator attempted to control for this variable by

assigning three topics of three major discourse classifications: expressing, reporting, and generalizing. Each phase of data collection contained one essay of each type, and the order of the essays was changed for each phase in the following manner:

Phase One	Essay 1	Expressing
	Essay 2	Reporting
	Essay 3	Generalizing
Phase Two	Essay 4	Reporting
	Essay 5	Generalizing
	Essay 6	Expressing
Phase Three	Essay 7	Generalizing
	Essay 8	Expressing
	Essay 9	Reporting

General instructions on essay assignments. All nine essays were accompanied by the following instructions:

> You will be given one hour to write the following essay. The number of words you produce is not important; but the organization, content, and form of your essay will determine your grade. Therefore, allow enough time of your hour to revise and edit what you have written. Be sure to give your essay a title.

Expressing--Essays #1, #6, and #8. The expressive writing tasks were accompanied by the following explanation:

> Expressing your feelings, emotions, and attitudes is an important part of life. Many times in writing, especially in writing for yourself, these feelings and emotions are expressed and no concern is given for whether or not the reader is in agreement. You do not have to defend what you say to the reader.

After this general introduction, the following expressive essay assignments were given:

Essay #1--Use your feelings and emotions to express what you feel is the most beautiful thing in the world.

Essay #6--Use your feelings and emotions to express what you feel is the best way to spend a vacation.

Essay #8--Use your feelings and emotions to express what you feel is the key to happiness.

Reporting--Essays #2, #4, and #9. The following general information was given for those writing assignments calling for reporting:

> Many times we write to describe events that have taken place in the world. The normal development of this writing, known as reporting, is chronological.

The following specific essays were assigned for reporting:

Essay #2--Use this hour to report on the events of your life. That is, write a short biographical sketch of yourself.

Essay #4--Use this hour to report on your most memorable vacation.

Essay #9--Use this hour to report on the funniest thing you've ever seen.

Generalizing--Essays #3, #5, and #7. The following general description of the task accompanied the three essays calling for generalizing:

> Writing often involves making a statement about some problem or event and defending this statement with facts or arguments. This writing focuses on the reader and seeks to convince the reader of the truth of what is being said. It is different from reporting in that reporting gives a chronological listing of the facts whereas this writing uses facts to support a statement or generalization.

After this general introduction, the following specific topics were assigned:

Essay #3--In this one-hour essay, make a generalization about the following topic and support this generalization with facts or arguments: Capitalism, socialism, and communism are three economic systems found in the world. Which is the best system?

Essay #5--In this one-hour essay, make a generalization about the following topic and support this generalization with facts or arguments: Should abortion be legal?

Essay #7--In this one-hour essay, make a generalization about the following topic and support this generalization with facts or arguments: Are men and women equal?

Writing and Interview Schedule

All subjects were provided with nine hour-long sessions in which to write and revise their essays. These sessions took place in the months of April and May, 1986, and all sessions were conducted during the morning. Two sessions a week were scheduled for each subject, either on Monday and Wednesday or on Tuesday and Thursday, extending data collection for each subject over a 5-week period.

Two planned interviews took place as part of the research design. The first of these interviews was conducted before the beginning of the writing of the first essay and served to gather background information on the subject. The second interview, a debriefing interview, was conducted after the writing of the final essay.

Sources of Information in Data Collection

There were four major sources of information in this research: researcher observations, audiotaping, interviews, and the products produced by each subject. Each of these sources of data will be briefly discussed below.

Researcher observations. The model of participant observation proposed by James P. Spradley (1980) guided the observational data collection throughout the three phases of this research. Although this model is intended for use in ethnographic research, it is equally useful for collection of data in case studies. Its guidelines provide the researcher with a viable means for gathering data that is potentially both valid and reliable.

Using this model, the researcher acted in the capacity of a primary data collection instrument. Objective observations of the researcher and subjective researcher feelings were recorded in detail throughout the observational sessions, and these notes were transcribed into formal written records shortly after each session.

As one of the primary interests in this research was to determine the function of visual and aural behaviors in the writing process, it was seen as important to record observations on a continuous basis in order to be able to examine these behaviors within the context of the writing. To facilitate the recording of the behaviors, the researcher devised a notetaking system which allowed for rapid recording of behaviors. First of all, when subjects wrote by hand, they did so on numbered, lined paper. This allowed the researcher to record the behavior in terms of the line it appeared on. Additionally, the Word-Talk word processing package produced an exact screen to paper replication of product, so behaviors during computer writing could also be recorded as to the line of writing they appeared upon. Secondly, the researcher developed a set of abbreviations for all behaviors which could be expected to occur during the writing process. These abbreviations were used throughout data collection.

When the observational notes were transcribed to written records, the abbreviations were written out in full and the record was cross-referenced with the written product. This gave the researcher a record of not only what kinds of behaviors occurred during the writing sessions of each individual, but also at what particular point in the writing process they occurred.

Audiotaping. Prior research on the composing process has suggested that considerable verbal activity surrounds the writing act of certain groups of subjects. A goal of the present research was to describe what aural activities accompanied the writing process of a group of adult NELB writers and to determine what function this verbal activity played in the writing process. For this reason, observational sessions were audiotaped, and the tapes were transcribed as part of the research record. During observational sessions aural activity was referenced in the observational notes so that when transcribing took place the aural behaviors could be placed in the records at the precise place in which they occurred. By analyzing aural behaviors in terms of the behaviors that surrounded them, the researcher was able to gain insight into what part they played in the writing process.

Interviews. A nonscheduled standardized interview (Appendix), a debriefing interview, and nonstandardized interviews (Denzin, 1978) were conducted as a source of data. The nonscheduled standardized interview served the purpose of gathering background information on each subject that could be used in interpretation of the data and in determining how similar subjects were on critical variables. The debriefing interview allowed the researcher to gather information on subject perception concerning writing behaviors and how these were affected by a change in

the writing medium. This interview also provided
information concerning subject attitude toward using a
computer as the tool in the writing process. Nonstandard
interviews with the subjects took place throughout the
research project. These interviews were conducted when the
researcher saw a need to clarify or confirm an observation
or to explore the writer's conception of what processes were
at work during the writing act. All interviews were
audiotaped and transcribed as part of the research record.

Written products. All written products, including
scratch sheets, that were produced during the research
sessions were collected as a source of data. These written
products were used to cross-analyze data from other sources,
to analyze changes made during reformulation, and to
determine if any observable change in the quality of the
written product resulted from the use of a microcomputer as
the tool in the writing process.

Data Analysis

Written records from this study included transcribed
observational notes, transcribed audiotaping of all verbal
behaviors, transcribed interviews, and the written
products. In the analysis of the data provided by these
written records, the researcher used three primary
strategies: inductive analysis of transcribed data, cross-
analysis of data sources, and scoring of the written
products by outside raters.

Inductive Analysis

The data for each individual in each phase of the research project were analyzed separately. The researcher began the analyses of these data by forming broad categories, such as "Visual Behavior" or "Follows Visual Behavior," and placing information from all the records available into appropriate categories. This information was referenced as to where it could be found in the original records. The categories were then again inductively analyzed and broken down into more narrow categories, such as "Horizontal Eye Movement" or "Question to the Researcher"; and, again, they were referenced as to where they could be found in the original records. This process was repeated two more times, for a total of four analyses, until no further categories could be ascertained. The resultant categories formed the basis from which conclusions were made.

Cross-Analysis of Data Sources

In an effort to strengthen the reliability of the study, the researcher continually cross-checked all sources of data in order to determine if these data were consistent. The transcribed records were compared to the written products continuously both to check the accuracy of observations and to clarify any unclear information. Additionally, information gathered from interviews was

compared to information obtained through observation to find if any inconsistencies existed. Finally, the researcher biases and expectations outlined in Chapter I were examined to determine how they might have affected observations.

Scoring of Written Products

Copies of the written products were sent to two experienced composition teachers and researchers for individual scoring. These raters were instructed to establish criteria for rating the essays with both a structure-specific and holistic score but to grade the compositions separately. The essays were arranged in such a manner that the scorers could not determine who was the author of any given essay or in which order the essays had been written.

Validity Measures

Both reliability of the data and generalizability of the findings are major concerns in any observational study. Do the data obtained represent reality as it exists? Do the findings describe the reality as it exists only for the subjects participating in the research, or are the findings applicable to a larger spectrum of the population? Certain measures were taken in this study to increase both the reliability of the data and the possibility of generalizing the findings. These measures will be briefly discussed below.

Operational Definitions

Behaviors under study were defined operationally before data collection began, and during observational sessions behaviors were recorded in these operational terms. Having behaviors operationally defined allowed the observer to record the behaviors without having to make immediate judgment as to the precise nature of these behaviors. It also allowed for the collection of potentially more objective data.

Examination of Researcher Biases and Expectations

Researcher biases and expectations were delineated before commencing data collection, and the biases were continually examined throughout data collection and analyses in order to determine how they might be affecting the reliability of the data.

Triangulation of Data Sources

Denzin (1978) discussed triangulation as a strategy which "directs the observer to combine multiple data sources, research methods, theoretical perspective, and observers in the collection, inspection, and analysis of behavior specimens" (p. 101). Using this definition, in this study triangulation was employed as a major research strategy. The researcher continually cross-checked data sources (observations, interviews, audiotapes, and products) and sought to understand these data from within the context of the literature reported in Chapter II. When observations

were confirmed through analyses of other sources, the researcher was confident that reliable data had been collected. When conflicting instances were found, these were noted and included as part of the findings.

Separation of Study into Three Phases

The three phases of data collection were identical except for one variable, the writing medium used for writing the essay. By controlling the other variables in the study, the researcher was better able to understand how the medium used to write could affect the writing process and important comparisons could be made.

Length of the Study

In general, as the amount of observation increases, the chances for obtaining valid findings improve. In order to increase the probability of obtaining valid data, then, each subject participating in this study was observed throughout the entire writing of nine essays. This allowed the researcher to be able to collect extensive data on each individual subject, and it was from this extensive data base that certain patterns could be found. These patterns formed the basis from which conclusions were made.

Control of Writing Tasks

Both type of discourse and whether or not the writing is self-sponsored or school-sponsored have been implicated as important variables in the writing process.

The researcher sought to control for type of discourse by assigning one task of each major type of discourse in each phase of the research and then analyzing to find out if subjects scored differently on different types of discourse.

To control for the variable of school-sponsored versus self-sponsored writing, the researcher held the variable constant. All topics were assigned by the researcher.

To further control for the variable of writing task, all subjects were asked to write on identical topics. These topics were presented in the same order to all subjects, and the writing assignment was accompanied by the same instructions for all subjects.

Scoring of Written Products

Written products were given to two outside raters to score. Having scores obtained from impartial raters increased the validity of these scores.

Use of a Control Subject

A major preliminary concern of the researcher was how to determine whether any changes in the writing process observed during Phases Two and Three could be attributable to the writing medium rather than to increased practice in writing and comfort with the research situation. In other words, the practice effect was seen as an alternative explanation for any changes in the writing process that might be observed in Phases Two and Three, and the researcher considered it important to control for this

threat to internal validity. As a means of control, one subject was selected for case study who lacked keyboard skills and who did not use the computer as a writing tool in Phases Two and Three. Rather, she wrote all nine essays by the traditional paper and pen method. With the exception of the writing medium used by the subjects to write during Phases Two and Three, the research situation and the procedures followed in data collection and analyses were the same for all four subjects. By replicating the case study except for this one variable, the researcher was able to compare data between the control subject and the other three subjects and determine if practice provided an alternative explanation for observed changes.

Replication

Replication provides a means whereby the external validity of a case study can be strengthened. By studying the same phenomenon under the same conditions using similar subjects, it is possible to determine if patterns of behavior cut across individuals and characterize at large the group under study. If patterns exist, it suggests that findings may be generalizable to a larger group.

Replication of the case study, and a search for patterns found in these case studies, was a major component in this research design. By replicating the case study the researcher was able to increase the likelihood of external validity. It is recognized, however, that although

replication provides a stronger argument for
generalizability, it does not guarantee it. The results of
this study may be generalizable only to similar subjects
writing under similar conditions in a laboratory setting and
not to all NELB adults unskilled in writing in English.

In the following chapter the findings of this study and
a discussion of these findings will be presented.

Overview

In this chapter the major findings from four case
studies will be presented and discussed in relationship to
information found in the literature review. The chapter is
divided into six major subheadings: (a) Background of the
Subjects, (b) Visual Monitoring--The Process, (c) Aural
Monitoring--The Process, (d) Process Into Product, (e) The
Computer as Tool--Interaction and Reaction, and (f)
Discussion.

As one of the major goals of this study was to
determine if the visual and aural behaviors used during the
writing process were affected when the writing medium was
changed, each of four subjects was studied across three
phases. In Phase One, the four writers wrote three essays
utilizing the traditional paper and pen method. In Phase
Two, three of the four writers wrote three essays using a
word processor. The fourth writer, who served as a control
for practice effect, continued writing by paper and pen
during Phase Two. In Phase Three, the control subject wrote
three essays by paper and pen while the other three subjects
wrote the same three essays using a word processor with

126

voice synthesizer feedback. As a result of collecting and analyzing data across the three separate phases of writing, comparison of phases across each individual could be made; and, subsequently, the data from individuals could be synthesized so that patterns occurring across individuals could be found. Individual subject findings and a synthesis of findings across the four subjects will be presented in this chapter under the major subheadings. These findings will be followed by a discussion.

<div align="center">Background of the Subjects</div>

Alex

Alex is an articulate 21-year-old male who is studying international law at a university in Barcelona, Spain. Alex was born in Barcelona; and although Catalan is the language spoken in his home, he is totally bilingual in Catalan and Spanish. He has had extensive English study, both formal and informal. He began his study of English as a child with tutors and later took English courses in nine different English language schools in Barcelona. Additionally, from the age of 9 to 16 he spent a month each summer in England, where he took English courses and lived in an English-speaking environment. At 17 and 19 years old, he spent 6 and 8 weeks, respectively, with a brother who lives in California; and during these visits, he also took courses in English. A few months before participating in this

research, he scored a 500 on the Test of English as a
Foreign Language (TOEFL).

Alex is verbally fluent in English; and although he
makes grammatical errors while speaking, he is quite capable
of carrying on a fluid conversation in an English which is
highly colored with slang and idioms. By his own account,
grammar is the area of English which gives him the most
difficulty.

Alex has written some essays in his English classes,
but he has done no extensive writing in English.

Alex considers that his primary sensory modality is
visual.

Helen

Helen is a 35-year-old married mother of two who was
born and raised in Asuncion, Paraguay, where she completed
her high school education. During high school, Helen took
several years of English as course requirements, and after
graduation she decided to continue her English training and
went to live and study English for a year and 4 months in
England. She was awarded the Cambridge First Certificate in
English at the end of this coursework.

After completing her studies in England, Helen married
an American citizen of Hispanic origin. Helen became a
naturalized American citizen in 1976. The same year, her
husband became a part of the diplomatic corps; and during
the last 10 years, they have lived in four different

countries: Panama, Brazil, Paraguay, and Spain. Stays in these countries have been broken by periods of residence in the United States which total 6.5 years. Whatever their country of residence, however, Spanish has been the primary language spoken in the home among all family members.

Helen is fluent in spoken English and can carry on a conversation in English with relative ease. Her self-declared problems with English are grammar and writing.

Although Helen wrote some essays in her English classes and occasionally writes letters in English, she has had little extensive practice in writing in English.

Helen feels her primary sensory modality is visual.

Patricia

Patricia is a 22-year-old who completed a 3-year professional degree in tourism in 1985. She is presently studying languages to further her qualifications in her profession. She was born in Barcelona; and although Spanish is her mother-tongue, she is also fluent in Catalan.

Patricia lived in Germany for a year when she was a child and also spent 1.5 months in England on two different occasions. She passed the Cambridge First Certificate in English in 1984 and is presently working on the Cambridge Proficiency Certificate for British English. Her language study in English has been undertaken through coursework as part of high school and through coursework in various English language schools in Barcelona.

Patricia considers speaking to be her major problem in English; and, in reality, her spoken English is labored and halting. One of her major problems in spoken English is lack of the appropriate vocabulary with which to carry on a conversation.

Patricia's experience in writing in English is limited, consisting of having only written essays in English classes.

Patricia considers that her primary sensory modality is visual.

Concha

Concha is in her last year of university, where she is studying for a degree in psychology. She was born 23 years ago in Barcelona; and although Spanish is the language spoken in the home, she is also fluent in Catalan. Most of Concha's English study was done in high school (one class of English for 7 years) and English language schools (3 years total), but she also spent a month in England on two different occasions. In 1985 she received the Cambridge First Certificate in English.

Although Concha's spoken English is sufficient for normal conversation, she lacks the vocabulary necessary to be completely fluent in English. By her own account, spoken English is the area that presents most difficulty for her.

Concha has written essays in English classes and writes letters to English friends, but she had not had extensive practice in writing in English.

Concha feels that she does not have a primary sensory modality, but, rather, that she makes equal use of all the senses in her learning.

Visual Monitoring--The Process

Description of Eye Movements Observed

Seven principal types of eye movements or actions indicating eye movement were observed and recorded during the nine writing sessions of the four subjects: (a) horizontal eye movements (HEM), (b) vertical eye movements (VEM), (c) horizontal and vertical eye movements occurring together (HEM/VEM), (d) indication of eye movements (IEM), (e) staring at product (STP), (f) staring off product (STO), and (g) cursor movement (CM). Each of these will be discussed below, and then the findings for the case studies will be presented for each subject and across the group.

Horizontal eye movement (HEM). Horizontal eye movement was operationally defined as the movement of the eyes in a horizontal direction while staying in the general writing area.   These eye movements were determined to be indicative of local rereading or scanning while writing.

Vertical eye movement (VEM). Vertical eye movement was operationally defined as a rapid movement of the eyes either up or down the written material already produced. Vertical eye movements were shown to be indicative of global scanning of the product.

Horizontal and vertical eye movements occurring together (HEM/VEM). Horizontal and vertical eye movements occurring together were operationally defined as a movement of the eyes first up the page and then horizontally while continuing in a downward direction. Horizontal and vertical eye movements occurring together were found to indicate rereading of parts or the whole of the product, i.e., global rereading.

Indication of eye movement (IEM). Actions such as moving a pen or a finger across a line of writing or body positions were found to be indirect indications that the subject was visually monitoring the written work. The movements were recorded in order to help the observer verify that the subject was rereading or scanning the writing.

Staring at product (STP). Staring at product was operationally defined as eyes staying fixed in the general writing area while the subject was hesitating and pausing. Staring at the product and horizontal eye movement may be confounded due to the inability of the researcher to at all times determine if the eyes were moving horizontally while the writer was staring at the product. This was particularly true when the computer was used for writing. Both STP and HEM were found to be indicative of local rereading and scanning; however, STP was also found to occur when the subject was thinking or contemplating the product.

<u>Staring off product (STO)</u>. When the subjects' eyes moved off the product to look at directions, to stare into space, to look at hands, etc., this activity was coded as STO. Although it is a visual activity, it was not found to be visual monitoring but, rather, an indication of thinking, contemplating the product, or mentally trying out something before writing. This eye movement was seen as an important variable in the study because of its relationship to STP, which was found to increase with computer writing while STO decreased.

<u>Cursor movement (CM)</u>. Cursor movement is similar to IEM but concretely involves the movement of the cursor up the screen, down the screen, across written words, or across written lines while writing with the word processor. Cursor movement was evident to the observer and, thus, was easily recorded and analyzed. Cursor movement was shown to be indicative of rereading and scanning.

<u>Alex</u>

The visual activity that occurred while Alex was writing during the three separate phases is shown in Table 1.

Table 1 shows an increase in number of eye movements from Phase One to Phases Two and Three and a decrease from Phase Two to Phase Three. The number of eye movements increased by 107% from Phase One to Phase Two and by 61% from Phase One to Phase Three. A decrease of 22% was seen from Phase Two to Phase Three.

Table 1
Frequency of Eye Movements Observed for Alex Across Phases

Type	Phase One	Phase Two	Phase Three	Total
HEM	3	6	1	10
VEM	11	0	0	11
HEM/VEM	24	0	2	26
IEM	14	9	7	30
STP	10	135	105	250
STO	31	17	6	54
CM	--	25	29	54
Total	93	192	150	435

Of particular interest in Table 1 is the increase of STP and, relatedly, the decrease in STO across the phases. In Phase One, 33% of the eye movements were accounted for by STO while 26% were accounted for by STP. In Phase Two, only 9% of the eye movements were STO while STP accounted for 70% of the recorded eye movements. In Phase Three, the percentages were approximately the same as in Phase Two: 4% of the observed visual behaviors were STO while 70% were STP.

Of the 435 instances of observed eye movements during the writing of Alex, 298 were followed by hesitating or pausing or more visual activity. A breakdown of the

activities following the remaining 137 instances of visual activity is shown in Table 2.

Table 2
Activity Following Visual Behavior for Alex Across Phases

Activity	Phase One	Phase Two	Phase Three	Total
Auditory Behavior	4	3	4	11
Adds Punctuation	4	1	3	8
Edits	37	23	20	80
Writes More Words	23	5	10	38
Total	68	32	37	137

Of particular interest in Table 2 is editing. Instances of editing following visual activity decreased from Phase One to Phase Two by 38%, from Phase Two to Phase Three by 13%, and from Phase One to Phase Three by 46%. In total, however, editing accounted for 58% of the 137 observed behaviors following visual activity.

Helen

A breakdown of the results of observed occurrences of eye movements during the writing of Helen is shown in Table 3.

Table 3
Frequency of Eye Movements Observed for Helen Across Phases

Type	Phase One	Phase Two	Phase Three	Total
HEM	13	0	0	13
VEM	3	2	0	5
HEM/VEM	11	4	1	16
IEM	12	6	0	18
STP	5	54	85	144
STO	14	4	5	23
CM	--	2	0	2
Total	58	72	91	221

The number of eye movements increased from Phase One to Phase Two by 24%, from Phase Two to Phase Three by 26%, and from Phase One to Phase Three by 57%.

Staring off product and STP followed much the same pattern for Helen as for Alex although somewhat more pronounced. In Phase One, 24% of observed visual activity was accounted for by STO while 9% was accounted for by STP. In Phase Two, STO accounted for only 6% of visual activity whereas STP accounted for 75%. In Phase Three, 6% of observed visual activity was in the form of STO while 93% was accounted for by STP.

A total of 102 of the 221 activities following visual behavior were hesitating, pausing, or more visual

activity.   A breakdown of the remaining 119 activities
following eye movements is shown in Table 4.

Table 4
Activity Following Visual Behavior for Helen Across Phases

Activity	Phase One	Phase Two	Phase Three	Total
Auditory Behavior	9	7	4	20
Adds Punctuation	2	5	0	7
Edits	7	9	2	18
Writes More Words	32	39	3	74
Total	50	60	9	119

Unlike Alex, Helen's visual activity was not frequently
followed by editing but was most frequently followed by the
writing of more words.   Editing accounted for only 15% of
the remaining activities following eye movements while
writing more words accounted for 62%.

Patricia

A synopsis of the number of eye movements observed
during the writing phases of Patricia is given in Table 5.

As with Alex and Helen, a general increase in the
number of observed visual activities was seen across the

Table 5
Frequency of Eye Movements Observed for Patricia Across
Phases

Type	Phase One	Phase Two	Phase Three	Total
HEM	24	1	0	25
VEM	14	1	0	15
HEM/VEM	23	2	4	29
IEM	5	0	0	5
STP	10	91	142	243
STO	22	10	1	33
CM	--	2	3	5
Total	98	107	150	355

three phases. There was an increase of 9% from Phase One to
Phase Two, an increase of 40% from Phase Two to Phase Three,
and an increase of 53% from Phase One to Phase Three.

Much of the increase in eye movements resulted from an
increase in STP. As with Alex and Helen, there was a
general decrease in STO and a general increase in STP across
phases. In Phase One, STO accounted for 23% and STP for 10%
of eye movements observed while in Phase Two STO accounted
for 9% whereas STP accounted for 85%. In Phase Three, 6% of
the observed eye movements were STO while 95% were STP.

In observances of eye movement, 217 of the 355 instances were followed by hesitating, pausing, or more visual activity. A breakdown of the remaining 138 is shown in Table 6.

Table 6
Activity Following Visual Behavior for Patricia Across Phases

Activity	Phase One	Phase Two	Phase Three	Total
Auditory Behavior	5	2	0	7
Adds Punctuation	10	7	0	17
Edits	12	9	1[a]	22
Writes More Words	59	33	0	92
Total	86	51	1	138

[a] Thirty words were inserted during this observation.

Patricia, like Helen, followed visual activity mostly by writing more words. Editing accounted for only 16% of the observed remaining 138 activities following visual behavior while writing more words accounted for 67%.

Concha

Concha showed an increase of 90% in the number of eye movements observed from Phase One to Phase Two, a decrease

of 20% from Phase Two to Phase Three, and an increase of 52% from Phase One to Phase Three. A comparison of the number of eye movements across phases is shown in Table 7.

Table 7
Frequency of Eye Movements Observed for Concha Across Phases

Type	Phase One	Phase Two	Phase Three	Total
HEM	1	1	0	2
VEM	2	1	2	5
HEM/VEM	5	6	4	15
IEM	0	5	3	8
STP	2	17	21	40
STO	11	10	2	23
CM	--	--	--	--
Total	21	40	32	93

Staring at product and STO are also of interest here as they account for 43% and 25%, respectively, of the visual activity observed. In Phase One, STO accounted for 52% of the number of eye movements observed while STP accounted for 10%. In Phase Two, STO accounted for 25% and STP for 42%.

In Phase Three, STO accounted for 6% while STP accounted for 66%.

Forty-four instances of visual activity were followed by more visual activity or hesitating and pausing. Of the remaining 49 occurrences, 27% were followed by editing and 37% were followed by writing more words. A summary of the 49 remaining activities following eye movements can be found in Table 8.

Table 8
Activity Following Visual Behavior for Concha Across Phases

Activity	Phase One	Phase Two	Phase Three	Total
Auditory Behavior	4	3	2	9
Adds Punctuation	0	3	1	4
Edits	2	5	6	13
Writes More Words	12	8	3	23
Total	18	19	12	49

Synthesis of Findings Across Subjects

Eye movements. An overall view of the types of eye movements used by each subject during the total writing process is presented in Table 9.

Table 9
Synthesis of Visual Activity Across Subjects

Type	Alex	Helen	Patricia	Concha	Total Number	% of Total
HEM	10	13	25	2	50	5%
VEM	11	5	15	5	36	3%
HEM/VEM	26	16	29	15	86	8%
IEM	30	18	5	8	61	6%
STP	250	144	243	40	677	60%
STO	54	23	33	23	133	12%
CM	54	2	5	--	61	6%
Total	435	221	355	93	1104	100%

The information on eye movements was combined for Alex, Helen, and Patricia, and the results of this synthesis are shown in Table 10.

Material from Table 10 can be contrasted to that of Table 7, which shows the breakdown of eye movements for Concha, who served as a control:

1. Group visual activity increased from Phase One to Phase Two by 50% while an increase of 90% was seen in the data from Concha.

2. Group visual activity increased by 5% from Phase Two to Phase Three whereas it decreased by 20% between these phases for Concha.

Table 10
Synthesis of Visual Activity Across Phases for Alex, Helen,
and Patricia

Type	Phase One	Phase Two	Phase Three	Total
HEM	40	7	1	48
VEM	28	3	0	31
HEM/VEM	58	6	7	71
IEM	31	15	7	53
STP	25	280	332	637
STO	67	31	12	110
CM	--	29	32	61
Total	249	371	391	1011

3. Group visual activity from Phase One to Phase Three increased by 58% and it increased for Concha by 52%.

4. In group data, STO accounted for 10% of eye movements during Phase One and STP accounted for 27%. For Concha, STO during this phase accounted for 52% of the visual activity while STP accounted for 10%.

5. In Phase Two, group STO decreased to 8% while STP increased to 76%. There was also a decrease in STO for Concha, but STO still accounted for 25% of observed visual activity. Staring at product increased to 42% during Phase Two for Concha compared to 76% for the group.

6. In Phase Three, STO accounted for only 3% of
observed visual behavior in group analysis and 6% in the
analysis of visual activity for Concha. Staring at product
increased to 85% of total visual activity for the group and
66% for Concha.

Activity following eye movements. An overview of the
activities other than hesitating, pausing, or more visual
activity that followed visual behavior for each subject
across the writing of the nine essays is provided in
Table 11.

Table 11
Synthesis of Activity Following Visual Behaviors Across
Subjects

Type	Alex	Helen	Patricia	Concha	Total Number	% of Total
Auditory Behavior	11	20	7	9	47	11%
Adds Punctu- ation	8	7	17	4	36	8%
Edits	80	18	22	13	133	30%
Writes More Words	38	74	92	23	227	51%
Total	137	119	138	49	443	100%

The frequencies of observances of each type of activity
following visual behavior across the three phases of writing
for Alex, Helen, and Patricia are given in Table 12.

Table 12
Synthesis of Activity Following Visual Behaviors Across
Phases for Alex, Helen, and Patricia

Activity	Phase One	Phase Two	Phase Three	Total
Auditory Behavior	18	12	8	38
Adds Punctuation	16	13	3	32
Edits	56	41	23	120
Writes More Words	114	77	13	204
Total	204	143	47	394

The information in Table 12 can be compared to that of Table 8, which shows a breakdown of activities following visual behavior for Concha:

1. Group editing decreased by 27% from Phase One to Phase Two while for Concha it increased by 150%. It should be noted, however, that editing did not frequently follow visual activity in the writing of Concha.

2. From Phase Two to Phase Three, editing by the group decreased to 44% of the total while it increased by 20% for Concha. Again it should be noted that the overall number of episodes of editing following visual activity was very small for Concha.

3. From Phase One to Phase Three, group instances of editing decreased by 59% while for Concha they increased by 200%. In actual number, however, the total increase was from two to six instances of editing.

4. Comparison of phases also shows an overall decrease in writing more words for both the group data and the data for Concha.

<u>Aural Monitoring--The Process</u>

<u>Description of Aural Behaviors Observed</u>

Six types of aural behaviors used by the four subjects were observed during the writing of the nine essays: (a) direct questions to the researcher seeking advice or information, (b) speaking-writing, (c) subvocalizations, (d) nonverbal vocalizations, (e) comments on writing or the product, and (f) oral rereading.

<u>Direct questions to the researcher</u>. Direct questions was operationally defined as questions directed to the researcher by the subject that indicated the subject was seeking advice or information with which to monitor something already written or to proceed with writing. These questions illustrated major monitoring concerns of the subjects and provided insight into the problem areas in writing for NELB adult unskilled writers. Ten types of direct questions were recorded:

1. The subject asked for a translation from Spanish to English.

2. The subject asked a question that showed a concern for appropriate word choice.

3. The subject asked a question that showed a lack of English vocabulary.

4. The subject asked for the correct spelling of a word.

5. The subject asked for the time.

6. The subject asked a question about grammar.

7. The subject asked a question that showed a concern for the length of the essay.

8. The subject asked a question that showed a concern for style.

9. The subject asked a question that concerned prewriting, such as the need for a title or how to begin the essay.

10. The subject asked a question concerning the use of the word processor or voice synthesizer (computer).

Speaking-writing. Speaking-writing was operationally defined as the vocalization of words as they were being written. This practice was found to be indicative of an aural checking of the spelling or a "sounding out" of a word as it went into written form.

Subvocalizations. Subvocalization was operationally defined as the vocalization of words below the comprehension level of the observer. Subvocalizations included whispering

and mumbling words and were found to be indicative of aural monitoring of writing.

Nonverbal vocalizations. Nonverbal vocalization was operationally defined as the production of sounds that carried no syntatic meaning. These sounds included sighing, humming, clicking the tongue, etc. and were shown to indicate a reaction of the subject to the writing or product.

Comments on writing or the product. Any statements made by the subject that referred to the act of writing or the product which was being produced were recorded and analyzed as comments on writing. These comments often provided insight into the act of writing and the subject's reaction to the particular writing at hand.

Oral rereading. Oral rereading was defined as the reading back out loud any part of the written product. Oral rereading was found to occur infrequently in this group of subjects; in fact, only one subject reread orally and this was done only twice in Phase Two. The fact that the oral rereading occurred over more than two paragraphs and only during Phase Two, however, was seen as being significant.

Alex

In total, Alex displayed 42 instances of aural activity in the writing of the nine essays. Of these 42 instances, 6 occurred during Phase One, 23 during Phase Two, and 13 during Phase Three. Twenty-three of the 42 instances of

aural behavior occurred as direct questions to the researcher seeking information or advice. A breakdown of direct questions can be found in Table 13.

Table 13
Frequency and Type of Direct Questions for Alex Across Phases

Type	Phase One	Phase Two	Phase Three	Total
Asks for translation	1	2	1	4
Concern for word choice	1	0	0	1
Concern with vocabulary	0	0	1	1
Concern with spelling	0	5	3	8
Concern with time	0	1	0	1
Concern with grammar	0	1	1	2
Questions about computer	--	3	3	6
Total	2	12	9	23

Eight instances of aural behaviors were of the variety of speaking-writing, three were subvocalizations, one was nonverbal vocalizations, five were comments on writing, and two were oral rereading. How these instances of aural behaviors were spread among phases is shown in Table 14.

From Phase One to Phase Two aural behavior increased by 283%, and from Phase One to Phase Three it increased by

Table 14
Frequency of Aural Behaviors Observed for Alex Across Phases

Type	Phase One	Phase Two	Phase Three	Total
Direct questions to the researcher	2	12	9	23
Speaking-writing	2	6	0	8
Subvocalizations	2	0	1	3
Nonverbal vocalizations	0	0	1	1
Comments on writing or product	0	3	2	5
Oral rereading	0	2	0	2
Total	6	23	13	42

117%. From Phase Two to Phase Three, however, there was a decrease of 44% in the number of observances of aural activity. It should be noted that the increases from Phase One to Phase Two and from Phase One to Phase Three are accounted for only minimally by direct questions to the researcher about the use of the word processor.

Results of the aural activity remained consistent throughout the three phases of writing for Alex. The results of direct questions included using the translation, spelling, or correct grammatical form supplied by the researcher; correcting errors; or leaving the correct form which had been verified by the researcher.

Results of speaking-writing included continuing to write the essay, continuing to reread, or editing.

Subvocalizations resulted in editing or rereading, and the one instance of nonverbal vocalizations resulted in correcting a typographical error in Phase Three.

The five instances of comments on writing resulted in editing or correcting a typographical error.

Finally, the two instances of oral rereading resulted in editing.

Helen

One hundred and seven instances of aural behavior were observed while Helen wrote the nine essays. These instances were fairly evenly divided among the three phases: Phase One had 33 occurrences, Phase Two had 43, and Phase Three had 32. Sixty-one of the observed aural behaviors were in the form of direct questions to the researcher seeking advice or information. A synopsis of direct questions is given in Table 15.

In addition to direct questions to the researcher, 7 occurrences of speaking-writing, 11 of subvocalizations, 5 of nonverbal vocalizations, and 23 of comments on writing were observed. A breakdown of observances of aural behaviors according to phases can be found in Table 16.

The overall occurrences of aural behavior were much higher for Helen than for Alex, and Helen showed a smaller

Table 15
Frequency and Type of Direct Questions for Helen Across
Phases

Type	Phase One	Phase Two	Phase Three	Total
Concern for word choice	0	0	3	3
Concern with vocabulary	0	2	0	2
Concern with spelling	4	12	5	21
Concern with time	2	0	0	2
Concern with grammar	0	0	1	1
Prewriting concerns	7	0	0	7
Questions about computer	--	18	5	23
Other concerns	1	0	1	2
Total	14	32	15	61

Table 16
Frequency of Aural Behaviors Observed for Helen Across
Phases

Type	Phase One	Phase Two	Phase Three	Total
Direct questions to the researcher	14	32	15	61
Speaking-writing	2	1	4	7
Subvocalizations	7	1	3	11
Nonverbal vocalizations	2	3	0	5
Comments on writing or product	8	6	9	23
Total	33	43	31	107

increase from Phase One to Two (a 30% increase). She showed a decrease of 28% from Phase Two to Phase Three and a 6% decrease from Phase One to Phase Three. Unlike for Alex, a large percentage of the increase in observed number of aural behaviors from Phase One to Phase Two can be accounted for by direct questions to the researcher concerning the use of the word processor. As a matter of fact, without these direct questions concerning the use of the word processor, aural behaviors would have decreased by 24% from Phase One to Phase Two.

Results of aural activity were consistent over the three phases. Results of direct questions included using the form suggested, changing the form when incorrect, and leaving the form when correct. All seven instances of speaking-writing involved mumbling or whispering a word while spelling it out and resulted in the word being written correctly six out of seven times. Results of subvocalizations included the subject's asking if a word was written correctly, finishing writing the word, or continuing to write a word. All five instances of nonverbal vocalizations resulted in editing or correcting a typographical error. The 23 instances of comments on writing resulted in (a) continuing to write, (b) rereading and editing, (c) leaving a mistake even though it was recognized, or (d) changing incorrect forms and leaving correct ones.

<u>Patricia</u>

Forty-seven instances of aural behaviors were observed during the nine writing sessions with Patricia. Of these 47, 13 occurred in Phase One, 24 in Phase Two, and 10 in Phase Three. All 47 occurrences of aural activity were in the form of direct questions to the researcher. A breakdown of these questions can be found in Table 17.

Table 17
<u>Frequency and Type of Direct Questions for Patricia Across</u>
<u>Phases</u>

Type	Phase One	Phase Two	Phase Three	Total
Asks for translation	7	14	1	22
Concern for word choice	1	0	0	1
Concern with vocabulary	0	0	5	5
Concern with spelling	3	5	0	8
Concern with grammar	2	2	1	5
Questions about computer	--	3	3	6
Total	13	24	10	47

As can be seen in Table 17, Patricia showed a moderate use of aural behavior during writing with an increase from

Phase One to Phase Two of 85%. She showed a decrease of 58% in aural behavior from Phase Two to Phase Three and a decrease of 23% from Phase One to Phase Three.

Questions asked about the use of the word processor represent only a minor part of the 85% increase in aural behaviors from Phase One to Phase Two.

Activities following aural behaviors were fairly consistent across phases and included using the researcher's suggestion, correcting a wrong form, or leaving the correct form.

Concha

There were 48 instances of aural behaviors observed in the nine sessions of writing of Concha. These observations were fairly evenly divided among the three phases of writing. Phase One had 19 occurrences; Phase Two, 15; and Phase Three, 14. Only two types of aural behaviors were observed being used by Concha, direct questions to the researcher and speaking-writing. Direct questions to the researcher are summarized in Table 18.

The other four instances of aural monitoring took the form of speaking-writing, and three of the four occurred in essay three of Phase One. The fourth was observed in Phase Two.

The activities following direct questions included using the form suggested, correcting a wrong form, or

Table 18
Frequency and Type of Direct Questions for Concha Across
Phases

Type	Phase One	Phase Two	Phase Three	Total
Asks for translation	11	10	9	30
Concern for word choice	3	0	0	3
Concern with vocabulary	0	1	1	2
Concern with grammar	1	2	3	6
Concern with length of essay	1	0	0	1
Concern with style	0	1	1	2
Total	16	14	14	44

keeping the correct form. Speaking-writing resulted in
asking for a translation, writing more, rereading, and
editing.

Synthesis of Findings Across Subjects

In Table 19 an overall view of the aural behaviors of
the four subjects is provided.

Using Table 20 a comparison of group data for Alex,
Helen, and Patricia can be made with that of the control,
Concha.

An analysis of the material in Table 20 showed that
there was an increase of 73% in the number of instances of
aural behavior from Phase One to Phase Two for the group

Table 19
Synthesis of Aural Activities Across Subjects

Type of Aural Activity	Alex	Helen	Patricia	Concha	Total
Direct questions to researcher	23	61	47	44	175
Speaking-writing	8	7	*[a]	4	19
Subvocalizations	3	11	*	*	14
Nonverbal vocalizations	1	5	*	*	6
Comments on writing or product	5	23	*	*	28
Oral rereading	2	*	*	*	2
Total	42	107	47	48	244

[a] An * indicates the absence of this activity.

Table 20
Synthesis of Aural Behaviors for Alex, Helen, and Patricia
Across Phases

Type	Phase One	Phase Two	Phase Three	Total
Direct questions to researcher	29	68	34	131
Speaking-writing	4	7	4	15
Subvocalizations	9	1	4	14
Nonverbal vocalizations	2	3	1	6
Comments on writing or product	8	9	11	28
Oral rereading	0	2	0	2
Total	52	90	54	196

while for Concha there was a decrease of 27%. Deleting
direct questions to the researcher concerning the use of the
word processor, however, group data would show a 27%
increase from Phase One to Phase Two. For the group,
including all aural behavior, there was a decrease of 67%
from Phase Two to Phase Three. Excluding questions about
the use of the word processor, this decrease is reduced to
35%. For Concha there was a decrease of 7% between these
two phases. From Phase One to Phase Three, there was a 2%
decrease in aural behavior for the group. When questions to
the researcher concerning the use of the word processor are

excluded, this decrease goes from 2% to 17%. A comparison
of Phase One to Phase Three for Concha shows a 36% decrease
in the number of instances of aural behavior.

In Tables 21, 22, and 23 an overview of direct
questions for the entire group is provided. In Table 21,
the total number of each type of direct question across all
subjects and phases of writing and the percentage of the
total this represents are shown.

Table 21
Percent of Total for Each Type of Direct Question Across All
Subjects for All Phases

Type	Total #	% of Total
Asks for translation	56	32%
Concern for word choice	8	4.6%
Concern with vocabulary	10	5.7%
Concern with spelling	37	21%
Concern with time	3	1.7%
Concern with grammar	14	8%
Prewriting concerns	7	4%
Concern with style	2	1.2%
Concern with length of essay	1	.6%
Questions about computer	35	20%
Other concerns	2	1.2%
Total	175	100%

In Table 22, a synopsis of direct questions by phase is provided.

Table 22
Frequency and Type of Direct Questions Across Phases for All Subjects

Type	Phase One	Phase Two	Phase Three	Total
Asks for translation	19	26	11	56
Concern for word choice	5	0	3	8
Concern with vocabulary	0	3	7	10
Concern with spelling	7	22	8	37
Concern with time	2	1	0	3
Concern with grammar	3	5	6	14
Prewriting concerns	7	0	0	7
Concern with style	0	1	1	2
Concern with length of essay	1	0	0	1
Questions about computer	--	24	11	35
Other concerns	1	0	1	2
Total	45	82	48	175

From Table 23, a comparison of subjects can be made with regard to the type of concerns shown through direct questions to the researcher.

Table 23
Frequency of Each Type of Direct Question for Each Subject

Type	Alex	Helen	Patricia	Concha	Total
Asks for translation	4	*[a]	22	30	56
Concern for word choice	1	3	1	3	8
Concern with vocabulary	1	2	5	2	10
Concern with spelling	8	21	8	*	37
Concern with time	1	2	*	*	3
Concern with grammar	2	1	5	6	14
Prewriting concerns	*	7	*	*	7
Concern with style	*	*	*	2	2
Concern with length of essay	*	*	*	1	1
Questions about computer	6	23	6	--	35
Other concerns	*	2	*	*	2
Total	23	61	47	44	175

[a] An * indicates an absence of this activity.

<center>Process Into Product</center>

Planning

    Planning was defined as the period between receiving the essay assignment and the beginning of the physical act of writing. In general, very little time was spent by the

subjects in planning their essays; the overall average was 92 seconds. A breakdown of the average number of seconds spent by each subject in planning during the three phases of writing is shown in Table 24.

Table 24
Average Time in Seconds Spent on Planning by Subjects Across Phases

Subject	Phase One	Phase Two	Phase Three	Average Across Three Phases
Alex	40	40	40	40
Helen	80	60	220	120
Patricia	140	160	140	147
Concha	80	20	80	60
Total Average	85	70	120	92

Writing

Writing was defined as the period from when the subject began the first word of the essay until the essay was turned in to the researcher. The average number of words per minute per phase of writing was calculated by dividing the total number of words in the three essays that comprised each phase and dividing this number by the total amount of time spent writing by each subject during each phase. The results of this calculation for each subject are presented in Table 25.

Table 25
Average Number of Words Per Minute Per Phase for
Each Subject

Subject	Phase One	Phase Two	Phase Three
Alex	10.94	6.19	5.37
Helen	7.11	3.39	4.16
Patricia	7.90	5.09	4.57
Concha	8.16	8.39	9.78

As can be seen in Table 25, the three subjects using a word processor showed a decrease in average words per minute (wpm) from Phase One to Phase Two while the control, Concha, showed an increase in average wpm. In percentages these numbers represent a 43% decrease in average wpm for Alex, a 52% decrease for Helen, a 36% decrease for Patricia, and a 3% increase for Concha. With the exception of Helen, the subjects using word processing also showed a decrease in average wpm from Phase Two to Phase Three. Alex decreased average wpm by 13% and Patricia decreased by 10%. Both Helen and Concha increased average wpm from Phase Two to Phase Three, Helen by 23% and Concha by 17%. From Phase One to Phase Three the three subjects using word processing decreased in average wpm. Alex decreased by 50%, Helen by 42%, and Patricia by 42%. Concha, on the other hand, had an

increase of 20% in average wpm from Phase One to Phase Three.

Reformulation

Reformulation was defined in this study as the changing of any part of the written product during writing, that is, from the time the first word was written until the product was turned in to the researcher. No distinction was made in this study between reformulation and editing and the two words are used synonymously.

Reformulation, or editing, was found to occur throughout the writing of the essays for all subjects, and most editing took place at the word or sentence level. Only one instance of a global change in the product was observed in all the sessions with all subjects, and this took the form of an addition of several lines to the written product during Phase Three writing by Patricia. Changes in editing habits were observed when subjects used word processing whereas the editing methods used by Concha remained fairly constant. The observed editing behaviors will be discussed below for each individual subject.

Alex. During Phase One, editing occurred throughout the essays, as it did during Phases Two and Three. Some editing was done at the end of the essay during Phase One whereas during Phases Two and Three very little editing was done after the body of the essay had been written. Additionally, during Phase One the heaviest editing occurred

at the end of paragraphs while in Phases Two and Three paragraph markers were rarely used and heavy editing was seen to occur mostly after punctuation marks.

Helen. Helen, for the most part, used no paragraph markers during any phase of writing and editing occurred at all stages of writing in all nine essays. In Phase One, however, there was a tendency to edit after periods, and this tendency disappeared during Phases Two and Three. Likewise, in Phase One little editing was done after the body of the essay was written whereas in Phases Two and Three there was a marked increase in editing after termination of the body of the essay.

Patricia. Patricia edited throughout the writing of the nine essays but showed a tendency to edit after periods and semicolons in Phase One while in Phases Two and Three this tendency changed to editing before punctuation. Patricia, like Helen, made little use of paragraph markers during the three phases and consequently did not show a tendency to edit at the end of paragraphs. Additionally, whereas in Phase One Patricia did not edit after the body of the essay was written, in Phases Two and Three there was a marked increase in editing at this stage.

Concha. In all three phases of writing Concha displayed the same editing behaviors. Some editing took place during the writing of each essay, but there was no tendency to edit after punctuation or at the end of

paragraphs. The largest amount of editing during her writing took place after the body of the essay had been completed.

Errors

A total of 539 instances of reformulation were observed during the writing of the nine essays by the four subjects. Of these 539 changes made to the written product, 502 were judged to be correct changes. This represents a 93% accuracy rate in editing changes.

All essays written by subjects during the course of this research were graded by two scorers to determine the number of unresolved errors remaining in each essay after the finished product had been turned in. The interrater correlation for unresolved errors was calculated for the two scorers using the Pearson product-moment correlation and was found to be +.98. A summary of the data pertaining to errors is presented in Table 26.

Holistic Scores

The same raters that scored unresolved errors in the nine essays of each subject also scored each essay with a holistic score that represents the overall quality of the essays, with a score of 4.0 being the highest. Using the Pearson product-moment correlation, a positive interrater correlation of .89 was found. An average of the two ratings was found, and the results of this scoring are presented in Table 27.

Table 26
Synthesis of Editing for Each Subject in Each Phase

Subject & Phase	# changes made	# correct changes	Avg.[a] errors unresolved	Avg. words/ essay	% essay remaining error
Alex (1)	95	89	181	664	27%
Alex (2)	60	53	105	380	28%
Alex (3)	68	62	89	276	32%
Helen (1)	38	32	27.5	268	10%
Helen (2)	20	20	13.5	151	9%
Helen (3)	18	18	19.5	147	13%
Patricia (1)	43	40	61	303	20%
Patricia (2)	41	36	64	233	28%
Patricia (3)	31	29	50.5	204	25%
Concha (1)	28	28	31	155	20%
Concha (2)	49	48	37	190	20%
Concha (3)	48	47	33.5	196	17%

[a] This average was obtained from outside raters. The interrater correlation using the Pearson product-moment correlation was +.98.

As can be seen in Table 27, the average holistic scores increased from Phase One to Phase Two for Alex, Helen, and Concha. This represents a 42%, 28%, and 23% increase, respectively. Patricia had a 20% decrease in her average

Table 27
Holistic Scores for Each Subject Across Phases

Subject	Phase One	Phase Two	Phase Three
Alex	1.05	1.5	1.0
Helen	3.0	3.83	2.83
Patricia	2.5	2.0	2.0
Concha	2.17	2.67	2.33

Note: These scores were obtained by averaging the two
scores given by the outside raters. The
interrater correlation for this rating using
the Pearson product-moment correlation is +.89.

holistic score from Phase One to Phase Two. Alex, Helen,
and Concha had a decrease of 50%, 35%, and 15%,
respectively, in their holistic scores from Phases Two to
Three while the scores of Patricia remained the same. From
Phase One to Phase Three, Alex had a decrease in his score
of 5%, Helen had a decrease of 6%, Patricia had a decrease
of 20%, and Concha had an increase of 7%.

Holistic scores of each individual were combined
according to type of essay to determine if there was a
difference among scores for each type of essay. It was
found that the average holistic score of each type of essay
across all writers was fairly consistent, indicating that

there was no confounding between essay type and holistic
scores. Results of this analysis are presented in Table 28.

Table 28
Holistic Scores for Each Subject By Type of Essay

Type of Essay	Alex	Helen	Patricia	Concha	Avg. Across All Subjects
Generalizing (3, 5, 7)	1.33	3.17	1.67	2.5	2.17
Reporting (2, 4, 9)	1.22	3.17	2.33	2.17	2.22
Expressing (1, 6, 8)	1.0	3.33	2.5	2.5	2.33

Note: These two scores were obtained by averaging the two
scores given by outside raters. The interrater
correlation for this rating using the Pearson
product-moment correlation is +.89.

Subjects, additionally, were asked to rank essays by
their difficulty level and no observable relationship was
found either between type of essay and rankings of
difficulty level or between holistic scores and rankings of
difficulty level.

The Computer as Tool--Interaction and Reaction

Word Processing

The word processing package Word-Talk chosen for this
research was selected for both its simplicity and its
ability to work in conjunction with a voice synthesizer.

One of its major advantages is that what is seen on the screen represents the exact layout of the print on paper and no doubt occurs about what the finished product will look like when it is printed. Corrections, changes, and additions on the monitor also become the same on the printed page; and, thus, the writer has immediate feedback as to how a particular change to the product will look. This monitor to print duplicity approximates very closely the process of writing by hand, then, but has a major advantage over handwritten changes to the product; namely, it does not leave the error or prior material on the page.

Word-Talk proved easy for the subjects to learn and master. Instruction in its use before the writing of essay four averaged 15 minutes over the three subjects, with Alex spending 12 minutes to learn; Helen, 13; and Patricia, 20 minutes. Individual interaction with and reaction to word processing varied, however, and these interactions and reactions will be discussed below for each individual subject.

Alex. When Alex began to write with the word processor, he looked at the keyboard and typed so fast that the researcher was unable to keep up with his exact words in the records. About a third of the way through the first essay written by word processor, however, he began to look up from the keyboard to the monitor approximately every two to three words, and his typing slowed down to the point that

the researcher could record the exact words being written. He continued this behavior throughout the writing of the rest of this essay and subsequent ones.

Alex's manual skills at the keyboard were adequate and he averaged approximately nine typing errors per essay. The number of typographical errors increased when he began to look at the monitor every few words, but he saw these typing errors immediately and corrected them.

Alex picked up the mechanics of the word processor rapidly and used it consistently to edit his work. He was neither confused by using word processing nor overpowered by it.

Alex's reaction to the use of the word processor was positive, and he felt that writing by word processor was better than writing by hand. As the following conversation shows, however, for him writing by word processor slowed down the writing process:

> Researcher: Would you use it if you had one?
>
> Alex: Yes, but it is a slow way to do it. If you don't write a lot and you aren't accustomed, you write really slow. I could only write 20 or 30 lines by computer and I wrote 40 or 50 lines by hand.

One advantage that Alex found with using the word processor was that he was able to change the product without leaving behind the telltale signs of change. The following conversation indicated that Alex also felt this "cleanness"

of the product helped him find his errors:

>   Researcher: Did you see your errors any better on the
>   computer than you did writing by hand?
>
>   Alex: Errors?
>
>   Researcher: Errors. Mistakes.
>
>   Alex: Yes.
>
>   Researcher: You did see them?
>
>   Alex: Yes. Yes. Yes, because it looks like
>   more . . . clean.
>
>   Researcher: Clean?
>
>   Alex: Yeah. Because I write a little weird. I don't
>   know why, I always make a lot of mistakes and I
>   am always rewriting the things. For example,
>   when I write something in class, I never have a
>   complete page clean. I don't know why. For
>   example on the computer you can write and you
>   wouldn't see . . . how do you say it?
>
>   Researcher: Scratch?
>
>   Alex: Scratch. That's terrible. The scratches are
>   terrible. That's why, for example, when I take
>   notes in class I rewrite them at home.

A final advantage that Alex found with the word

processor was that it allowed him to see the whole of the

product without shuffling around papers. His reaction to

this can be seen in the following conversation:

>   Researcher: Did you find that anything changed when
>   you used the word processor? Forget the
>   voice now. When you used the word
>   processor, did anything about writing
>   change for you?
>
>   Alex: Yes, because when I write by hand I have a lot
>   of pages but . . . at the computer you have all

the parimeter and you can see all the sentences
together, you know. And while you're writing by
hand, you only write what you see and when you
turn the page you just finish with it, and you
start a new one, you know. And you can't refer
to the . . . that part because if not you will
be always turning the page over again and again
and again. Turn again and write again. You
will spend a lot of time doing that, but on the
computer you have the page on.

Helen. Of the three subjects, Helen had the most

difficulty with learning how to use the word processor and

with her typing skills. During the writing of the first

essay by word processor, Helen typed very slowly and kept

her eyes on the screen. She made many typographical errors,

almost one per word, but she corrected them immediately.

She commented during this session that she made mistakes in

typing because she was not used to the machine. She found

that the keyboard was small compared to that of the

typewriter she had been using. In subsequent sessions,

however, her typing speed improved and fewer typographical

errors were made.

Helen was also the only subject who felt somewhat

intimidated by the computer in earlier sessions. She

expressed this intimidation when she said, "You know, I

mean, I am a little afraid of it yet." She gradually built

up self-confidence in her ability to use the word processor

and in later sessions applauded herself when she

successfully edited her work without having to ask the

researcher for help.

Finally, Helen was the only subject whose eyes stayed on the screen consistently, both when typing and when hesitating or pausing.

Helen, like Alex, had a very positive reaction to the use of word processing. She found it more "entertaining" than writing by hand, found it easier to correct errors, and found that she could "see" errors better. Evidence of this is found in the following conversation:

> Helen: I think this is more. . . . This in a way was more work because I don't know how to. . . . I mean . . . this is still . . . this is new to me. But because of that. But it's more . . . entertaining. Because you're looking and you can . . . you're also watching while you're writing but this is . . . it's sort of different when you can look at the . . . your same eyes.
>
> Researcher: Do you know why it's different? Do you have any idea why it's different? Do you see things better? Do you see your errors better when writing here?
>
> Helen: Yes, oh yes. Definitely.
>
> Researcher: Automatically you see the error?
>
> Helen: Not all the time because I was busy looking, you know, at all this (indicated the keyboard), but, but I think it's easier to correct them; and it's, you know, in a way it's easier to see the errors. To me you see them more than when you're. . . . You don't have to pay that much attention when you're writing. You know you can write something unless you know beforehand that you don't know how to write a word. Then you know you might make a mistake but otherwise you look and maybe you won't notice and when you read it over again here if you're looking you can see. It comes right out.

Finally, she felt that her writing actually improved with the use of the computer as tool and that this improvement in part was caused by being able to see the written product in its entirety on the screen. The following conversations illustrate this reaction:

Researcher: First of all, did you find any difference in writing when you used a word processor? Just the word processor without the voice? Did anything change?

Helen: Yes, I liked it better.

Researcher: You liked it better.

Helen: Um, huh.

Researcher: Why?

Helen: I don't know. (Laughs) It seems to me that you can see more clearly when you see what you're writing. You can go over faster or something. And make changes a easier way than if you're writing by hand. And as I was writing the essays, I personally think that the ones I've written with the word processor . . . or the voice . . . what is it, the voice . . .?

Researcher: The voice synthesizer.

Helen: . . . the voice synthesizer are better. I don't mean the context of it, but, um, more correctly . . . the expressions are better in those essays.

Researcher: The expressions are better?

Helen: Yes.

Researcher: O.K. You mean your use of English is more . . . native?

Helen: Yes.

Researcher: O.K. Umm. . . .

Helen: To me it helps having it right in front of
        you. Although when you write by hand you have
        it right in front of you, too, but it seems
        more, I don't know, it seems better when you
        have it written in print.

Researcher: Do you see it differently?

Helen: Yes.

Researcher: You see it differently. Do you have any
        idea in what way?

Helen: Uh, I don't know exactly. It's just that to
        me, I . . . it's easier . . . first of all it's
        easier to read something that it's on the
        screen, and . . . it might maybe gives it
        efficient. I don't know. (Laughs) You'll be
        looking at it, there was something I can't
        explain it exactly but to me it's easier to go
        over something that you have written if it's on
        the screen right across from. . . . It might
        be the same thing, but to me it isn't. I liked
        it better.

Researcher: Did you find your errors better on the
        word processor?

Helen: Yes.

Patricia. Patricia typed fairly fast and made an
average of approximately four typographical errors per
essay. When typing, she tended to look at the keys, but she
paused and hesitated frequently to look up at the monitor.
She took longer initially to learn the mechanics of the word
processor than did Alex and Helen, but once she began
writing the essays she spent very little time seeking
information about how to use the word processor.

Patricia's reaction to word processing was also very positive. She liked it, first of all, because it helped her "see better." She felt that part of "seeing better" was due to the fact that she reread more frequently when writing by word processor, and this rereading helped her see her errors more clearly and go forward with her writing. By her own account, however, this did not make the subject of the essay any easier to write about. A second reason she preferred writing by word processor to writing by hand was that she could correct her writing easier and because she could see how the changes to the document looked right away. For her, this was one of the greatest benefits of writing by word processor.

Voice Synthesization

For the writing of the last three essays, those of Phase Three, the voice synthesizer Echo Plus was available for use in conjunction with the word processing package Word-Talk. This combination made available to the subjects the following possibilities: (a) immediate oral letter feedback, (b) delayed reading back of a word of the essay, (c) delayed reading back of a line of the essay, and (d) delayed reading back of an entire screen of the written product.

Learning to use the voice synthesizer was accomplished in 3 minutes by all three subjects; and upon beginning the writing in Phase Three, subjects were instructed to use the

voice synthesizer in any way they wanted. Individual interactions with and reaction to voice synthesization will be detailed below for each subject.

Alex. In the first essay of Phase Three, Alex was seen "trying out" the voice synthesizer. He first wrote for several lines with immediate letter feedback and then turned it off. A little further in this essay he again turned on the letter feedback for a few more lines and then turned it off again and left it off until he finished the body of his essay. Also, he used delayed reading back of the product contained on the screen after he had written several lines. He then had the total product read back after he had finished writing. Two times he had individual lines read back to him.

In the second essay, Alex wrote one word and turned off the letter feedback. Several lines later he turned back on the letter feedback but turned it off again a few seconds later and left it off until the end of the essay. At one point in the writing of this essay he used the voice synthesizer to read back the line he was writing on and then had the same line read back again word by word. At another point he let the voice synthesizer read back three lines of text previously written. Finally, he changed "there're" to "there's" in a line and then had the voice synthesizer read back this line.

In the last essay, Alex typed one letter and turned off
the letter feedback. At three points in the writing of the
essay he turned back on the letter feedback and turned it
off again after several words. He also used the delayed
feedback to read back one line previously written and to
read back the whole screen when the body of the essay was
finished. He allowed the voice synthesizer to read back
only half the screen, however, before stopping the delayed
feedback.

Alex's reaction to the voice synthesizer was negative,
and he found no advantages to using it. As the following
conversation illustrates, for him the voice synthesizer was
not understandable and the letter feedback interfered with
his thinking:

> Researcher: Now, when we added the voice synthesizer,
> did you . . .?
>
> Alex: I don't like it.
>
> Researcher: You don't like it? It didn't do anything
> for you?
>
> Alex: No. It's like when you're writing a story or
> something and someone is speaking at the same
> time. Oh, come on! Silence, please!
>
> Researcher: It interrupted the way that you were
> trying to think?
>
> Alex: When you put a p, "p" (referring to the
> immediate letter feedback), g, "g." No. Come
> on!
>
> Researcher: What about when it read back the things to
> you, did that help you at all?

Alex: No, no.

Researcher: Nothing. For you it was a big zero?

Alex: It is a voice with noise, and it is difficult to understand. Maybe not you because you are American. It's like a . . . well, it's a synthesized voice. It's really difficult. I don't understand it.

Helen. Helen left the letter feedback on during the writing of all three essays in Phase Three. The voice feedback left her free to watch the monitor and helped her discover typographical errors, which she corrected immediately. She used delayed feedback only on the second essay; and when she visually followed along as the voice synthesizer was reading back her work, she discovered errors and corrected them. She did not use delayed feedback for the first essay in Phase Three because she did not understand that it had this capability, and for the last essay she was in a hurry to finish the essay in order to go to an appointment and either forgot to use delayed feedback or did not want to spend time correcting her essay.

Helen's reaction to voice synthesization capabilities with the word processor was positive both for letter feedback and delayed feedback. She felt that with the letter feedback she had not made as many mistakes in her writing and the typographical errors could be corrected more quickly. She also felt that the delayed feedback helped her find mistakes and monitor her work for style, as the

following quotations indicate:

>Helen: With the voice somehow it seems to me that I
>haven't made as many, ah, spelling mistakes.
>Because of the voice. Or you can correct them
>quicker. In fact, I have enjoyed the voice.
>Which I didn't expect I was.

>Helen: I like it with the voice. More than without
>the voice. I don't think I make as many
>mistakes. I don't know whether it's because
>I'm getting . . . after not writing too much
>. . . but I don't make many mistakes.

>Helen: You know what is good? When it repeats at the
>end. When it repeats everything because then
>it gives you the chance to listen to what you
>have written. It's not the same. It doesn't
>usually understand what you write. When
>somebody else reads to you what you've written,
>it sounds very different. It gives you an idea
>if maybe something doesn't sound right or it
>has too many of the same words or something
>like that. That's clear about it. You know
>when you, when it reads at the end the whole
>paragraph.

>Researcher: It's like having somebody else read it and
>you read along?

>Helen: Yeah. Yeah. That's how I, I. . . . (points to
>the screen).

>Researcher: You found your mistakes?

>Helen: Yeah.

As the following conversation indicates, the seeing and
hearing together was what helped Helen with her corrections
and having the voice synthesizer read back was, for her,

like having another person read back her essay:

> Researcher: And what about when you put the voice
> synthesizer?
>
> Helen: That was even better. (Laughs) It was fun.
>
> Researcher: That was even better. What happened?
>
> Helen: Well, to me it helps even more than . . . the
> fact that you're seeing plus hearing, you're
> listening to what you're writing, helps even
> more to correct errors and to give you a
> perspective if someone else is reading to you
> what you're writing. And it always sounds
> different when somebody reads to you than when
> you're just reading yourself what you've just
> written. To me it gives me . . . uh, you can
> be more critical when you listen than when you
> are reading aloud.

Understanding the voice synthesizer took a little practice for Helen, but she found she got used to it. As the following conversation illustrates, she became enough accustomed to it that she would use one were it available to her:

> Researcher: What about the quality of the voice
> synthesizer?
>
> Helen: This one?
>
> Researcher: Um, huh. Did it bother you or was it just
> the same as having another voice?
>
> Helen: Oh, you mean as a normal voice?
>
> Researcher: No, I mean the fact that it talks funny,
> the voice synthesizer, did that detract?
>
> Helen: You get used to it. No, at first because I
> wasn't familiar with it, it . . . I noticed the

voice. And I thought that it would bother me,
but, in fact, it happened completely the
opposite because I liked it very much. I don't
know. It was . . . was . . . I would write
with the voice all the time.

Researcher: You would write? If you had it, you would
write with the voice on?

Helen: Yes.

Researcher: So for you, you think it helps you
find. . . .

Helen: Yes. It gives me another per- . . . especially
when you have finished your composition and you
have it read back. Even though it's not a
normal voice, but still it gives you an idea
whether it sounds good or whether you have used
one word too many times, for instance.
Sometimes when you read it you don't realize.
You can read it over and over again and you
don't realize the mistake of using one word
over and over again. When you listen, then, to
me, the, I can say, "Well, no, I've used this
word too many times," or "It doesn't sound
right." So when it reads back the final
composition and you can . . . and even though
you have made some corrections before . . . you
can, you can correct more if you like to do
it. I found that an advantage.

Patricia. In all three essays in Phase Three, Patricia
turned the letter feedback off before beginning to write and
left it off for the duration of writing each essay. In the
first two essays, but not the third, of this phase, she used
the delayed feedback to read back her whole essay.

Her reaction to the voice synthesizer was that she did
not like it because it was not comprehensible and because
the letter feedback interrupted her thought processes.

<u>Discussion</u>

<u>Visual Monitoring--The Process</u>

Data contained in Tables 1-12 illustrate that visual activity played an important part in the writing process for the subjects participating in this research. The type of visual behavior used by each subject and its purpose varied, however, and the frequency of visual behavior was dependent upon the individual subject. There is evidence also that the frequency of visual behavior increased from Phase One to Phases Two and Three for those subjects writing by word processor.

In general, Alex and Patricia used the most visual monitoring, averaging 58 and 60 visual behaviors per minute of writing, respectively. Helen averaged 45 visual behaviors per minute and, finally, Concha was seen to use visual behavior at a rate of only 11 behaviors per minute.

Comparing Phase One to Phases Two and Three for each subject, the number of average words per minute decreased for the three subjects using word processing while it increased for Concha. At the same time, comparison of these phases shows an overall increase in frequency of visual behaviors for all subjects. For Alex, the largest increase was from Phase One to Phase Two while for Helen and Patricia the largest increase in frequency of visual behaviors was between Phases One and Three. Concha, while showing an increase in visual behaviors from Phase One to Phase Two and

from Phase One to Phase Three, showed an overall smaller
gain in real number of visual behaviors, especially if the
fact that her average words per minute increased over these
phases is taken into consideration.

All subjects made use of local rereading and scanning
(HEM), global scanning (VEM), and global rereading
(HEM/VEM); that is, visual monitoring of the written product
was observed in the writing process of all subjects.
However, Alex most consistently used all three forms of
visual monitoring, i.e., local rereading, global rereading,
and scanning. He also most frequently edited after this
visual monitoring. Helen most frequently used local
rereading to monitor her work and followed this monitoring
most often by writing more words. Patricia used both global
and local rereading and followed this frequently by writing
more words. Finally, Concha made moderate use of global
rereading and local rereading, but much of her global
rereading was done after the body of the essay was
completed. Her local monitoring was frequently followed by
writing more words and her global rereading by editing.

The visual behavior most commonly observed in the
writing of all subjects was staring at the product (STP).
This behavior was seen to increase drastically from Phase
One to the other two phases, particularly for those subjects
writing by word processor. Part of the increase in STP from
Phase One to Phases Two and Three for those subjects writing

by word processor can be accounted for by the observer's inability to ascertain what kind of eye movements were occurring when the subject was watching the computer screen and the subsequent recording of the activity as STP. The substantial increase in this variable across phases, however, would indicate more than simply a miscoding of behaviors.

The second most common visual behavior observed across all subjects was staring off the product (STO). Whereas STP was seen to increase across phases, STO was seen to decrease. For the three subjects writing by word processor, the biggest decrease in STO occurred from Phase One to Phase Two whereas for Concha the decrease in STO from Phase One to Two was only from 11 to 10.

The increase in STP and parallel decrease in STO are explained in part by the subjects' increased comfort with the research situation and the writing act and may, indeed, explain all the data of Concha. The dramatic increase in STP and decrease in STO for those subjects writing by word processor, however, suggest that familiarity with the writing situation does not offer a full explanation. Indeed, observations of the subjects using word processing verified that the visual behaviors of these subjects were altered almost from the first moment that writing by word processor began. Subjects using the computer focused their attention more closely on the written product, particularly

in the general writing area, than they did while writing by
hand; and such visual behaviors as staring into space and
looking at directions were greatly reduced. These same
subjects reported that they reread more frequently when
writing by word processor, so much of this increased focus
involved visual monitoring of the product. However, a part
of STP involved no movement of the eyes whatever, and it is
therefore concluded that part of the increased focus on the
product involved staring at the product while thinking and
planning.

The increased focus on the product seen in the writing
of those subjects using the computer resulted in a
quantitative change in writing. Whereas Concha increased
the average number of words per minute across phases, the
subjects using word processing drastically reduced the
number of words written from Phase One to Phases Two and
Three. This slowing down of the writing process for Alex,
Helen, and Patricia was observed to be caused almost
exclusively by increased STP.

There is also some evidence in this data that visual
monitoring was changed qualitatively when writing by word
processor, as suggested by O'Brien (1984). Subjects
reported "seeing" errors and what they had written better on
the computer screen, and they commented that the written
words looked "different" on the screen than on paper. No
subject could successfully describe in what way the written

product looked different or why words and errors could be seen better on the monitor, but subject reaction suggests that words on a computer screen are somehow visually perceived differently than words on a handwritten page. As Pick and Saltzman (1978) pointed out, perception is influenced by much more than the sensory modality used in perceiving. While subjects used the visual mode for reviewing the product in both writing by paper and pen and writing by word processor, they reported "seeing" better or differently when writing by word processor. This would indicate a change in perception caused by some factor related to the presentation of written words on the computer screen. What factor on the computer screen influenced this change in perception, however, is only speculative. Possibilities include (a) the configuration of the words on the screen (i.e., even margins, straight lines, regular spacing, etc.), (b) the contrast of green letters on black background, (c) the standardized form of the printed letters, and (d) the presentation at eye level of a large piece of the written product (or whole product in many cases).

Despite evidence suggesting increased visual monitoring when writing by word processor, there did not appear to be any advantages from this increase for quality of the product, at least in the short run. As a matter of fact, there is some indication that the product was negatively

affected for those subjects using word processing. For Alex and Patricia, for example, the percentage of essay remaining error for Phases Two and Three was somewhat higher than for Phase One. For Helen, the percentage of essay remaining error was lower for Phase Two than Phase One by 1% but was 3% higher for Phase Three than Phase One despite the fact that she felt she had made fewer errors in Phase Three. For Concha, on the other hand, the percentage of essay remaining error did not change from Phase One to Phase Two and was 3% lower for Phase Three.

These data cannot be explained in terms of editing because although frequency of editing declined across phases for the subjects using word processing and went up for Concha, there was a proportional decline and rise, respectively, in average words per minute across phases. This suggests that the frequency of editing behaviors remained fairly constant for all subjects across all phases of writing.

A possible explanation of the data is that those subjects writing with the word processor in Phases Two and Three needed to attend not only to the writing process, but also to the use of a machine that was not familiar to them, thereby detracting from the writing process itself. This explanation undoubtedly accounts in part for the decrease in average words per minute seen in the writing of those

subjects using word processing but does not sufficiently explain the increase in percentage of essay remaining error, especially considering that visual monitoring behavior increased in Phases Two and Three.

Another possible interpretation of these data can be abstracted from the work of Mimi Schwartz (1982). As Schwartz pointed out, word processing facilitates the rereading of the text during the intermediate stages of writing. From the data obtained in this study, it appears that it not only facilitates rereading, but also encourages it. Subjects using word processing became almost mesmerized by the computer screen, focusing attention on the product while hesitating and pausing more frequently and for longer periods of time than when writing by hand. If, as Flowers and Hayes (1981) suggested, this stopping to contemplate the product demonstrates global planning, then writing by word processor may encourage global planning. With global planning being more attended to, it would be highly possible that sentence level errors would be of less concern, causing an increase in percentage of essay remaining error across phases. Judging from the holistic scores shown in Table 27, however, there is no indication that the increase in global planning that may have resulted from using word processing positively affected the overall quality of the essay.

Aural Monitoring--The Process

Aural behaviors were observed in the writing of all
four subjects during all phases of writing, but the only
type of aural activity observed in all writers was direct
questions to the researcher, which accounted for a full 72%
of the total 244 instances of aural behavior observed.
Commenting on the writing or product was the second most
frequent type of aural behavior observed, accounting for 11%
of the total, but this type of aural behavior was observed
only in the writing of Alex and Helen, with Helen
contributing 23 of the 28 observances. Speaking-writing was
seen to occur in the writing of Alex, Helen, and Concha but
not in that of Patricia, and speaking-writing was seen in
only 8% of the total observances of aural behavior.
Subvocalizations and nonverbal vocalizations accounted for
6% and 2%, respectively, of the total number of aural
behaviors observed, and these were seen to occur in the
writing of only Alex and Helen. Finally, oral rereading was
observed only twice and only in the writing of Alex. Both
instances of oral rereading were for two or more paragraphs.

The activity following aural behavior depended upon the
type of behavior observed. Direct questions to the
researcher, for all subjects, were followed by using a
translation, word, or grammatical form suggested by the
researcher; correcting the spelling or grammatical form when
incorrect; and leaving the form or word that had been

verified by the researcher as correct. Speaking-writing resulted in continuing to write the essay, continuing to reread silently, editing, successfully completing a word being written, and asking for a translation. Subvocalizations were observed to be followed by editing, rereading, directing a question to the researcher, and completing the writing of a word. Nonverbal vocalizations resulted in correcting typographical errors and editing. Commenting on the writing or product was followed by rereading and editing, correcting typographical errors, and continuing to write. In the case of Helen, commenting on the writing or product was also followed several times by leaving a mistake even though it had been recognized. The two instances of oral rereading resulted in editing. All the activities following aural behaviors remained fairly constant across phases.

As can be seen from the activities following aural behavior, the auditory mode is used in writing to help monitor written work in both translation of ideas to paper and review of the written work. Unlike visual behavior, aural behavior was not frequently followed by writing more words; rather, it was most frequently followed by some form of reformulation.

Alex made a moderate use of aural monitoring, as did Patricia and Concha, but Alex was the only subject to use all types of aural behaviors observed. Patricia used only

direct questions to the researcher, and Concha used only direct questions to the researcher and speaking-writing (four instances). Helen, on the other hand, frequently used aural monitoring during writing (a total of 107 times) and used all types of aural behaviors except oral rereading. Twenty-three of the instances of aural behaviors in Helen's writing were in the form of direct questions to the researcher about the use of the computer, and without these questions her total would have been only 84 observed occurrences of aural behavior. This frequency of aural behaviors, however, is almost double that of the other subjects. Additionally, whereas direct questions to the researcher accounted for the largest percentage of aural behaviors for all subjects, Helen was also seen to use commenting on the writing or product in 22% of the instances of aural behaviors. No other behavior beyond direct questions to the researcher approximated this high a percentage for any other subject.

Comparison of phases shows an increase in aural behaviors from Phase One to Phase Two for Alex, Helen, and Patricia, but this increase can be considered a real increase only for Alex and Patricia because without questions concerning the computer, Helen would have shown a 24% decrease in aural behaviors from Phase One to Two. Concha showed a small decrease in aural behaviors from Phase One to Phase Two (from 16 to 14). From Phase Two to Phase

Three aural behavior decreased for Alex, Helen, and Patricia while it remained the same for Concha. For Helen and Patricia the frequency level of aural behavior dropped to approximately the same frequency level as in Phase One. Alex used more aural monitoring in Phase Three than Phase One; but in terms of real numbers, the increase was only from 6 to 13.

The patterns found in these data suggest that the word processor initially stimulated aural activity for those subjects using the computer but that over time the behavior returned to approximately the same level as when the subjects were writing by hand. A possible explanation of this increased activity during Phase Two is provided by what statisticians refer to as the novelty effect; that is, an increase in scores or measures may be seen due to the newness and uniqueness of the research situation rather than real gain. The novelty effect has been shown to inflate scores in other investigations involving the use of the computer, and it is seen as accounting for the increase in aural behaviors for the computer group in Phase Two. If the effect had been a real one, there should have been an increase from Phase One to Phase Three as well as for those subjects using word processor, but this increase was not seen.

An interesting insight into monitoring concerns of NELB adult writers has been provided by the data on direct

questions to the researcher. A full 42% of direct questions to the researcher were centered around the word, with subjects either asking for a direct translation from Spanish to English or explaining what they wanted to say in English and having the researcher help them find the appropriate word. It should be noted, however, that the two subjects most verbally fluent in English, Alex, and Helen, were not at all concerned with their vocabulary during writing. As a matter of fact, Helen never asked for a translation in all the sessions, and Alex asked for one only four times. Another 21% of direct questions to the researcher concerned the appropriate spelling of a word. A surprisingly low 8% of monitoring concerns were grammar concerns. Prewriting concerns, concerns with style, concern with the length of the essay, and concern about the amount of time for writing were practically negligible.

Subtracting the number of questions asked about the computer, direct questions still increased from 45 to 58 from Phase One to Phase Two, and the majority of this increase was taken up by questions concerning spelling, which increased from Phase One to Phase Two from 7 to 22. This was the largest single increase witnessed in direct questions and would support the idea that visual perception using the computer screen may be different from visual perception of words written by hand; that is, writers may actually "see" words better on the computer screen, thereby

monitoring their spelling more frequently. This increased visual monitoring may have stimulated the aural monitoring, causing the frequency of aural behaviors to increase during Phase Two. At the same time, however, it appears that for this group of subjects, a group with very little experience in writing in English, the monitoring done served the purpose of reformulation at the word or sentence level rather than on a global level. Observations of the subjects, as a matter of fact, showed only one instance of what could be considered a global change in the written product. This global change was made by Patricia and involved the insertion of several lines in the body of the composition while writing by computer.

Further support is given to the conclusion that reformulation for this group of subjects centered around the word by the data on direct questions. For example, prewriting concerns were observed only in Phase One, and most of the questions asked concerned how the researcher wanted the essay done and whether or not to put a title. Additionally, these questions were asked by only one subject, Helen. Likewise, only two questions concerned style, and both these questions were asked by Concha. No questions at all were asked about audience, approaches to the topic, clearness of presentation, introductions to the topic, conclusions for the essay, cohesion of the ideas, or other aspects of writing that illustrate global concerns of

writing. Finally, the small amount of questions concerning grammar would indicate that most concerns did not even reach the sentence level.

Process Into Product

Planning. Very little time was spent by subjects planning their essays before beginning the physical act of writing. There is evidence, however, particularly in the data on visual monitoring, that planning is an activity that occurs throughout the writing process and that word processing stimulates this planning. The frequent occurrences of hesitating and pausing accompanying visual activity with the subsequent writing of more words suggests that these episodes of nonwriting were used to plan the next part of the essay.

Writing. In general, Concha wrote fewer words than other subjects but the average number of words per minute increased across phases for her. The three subjects writing by word processor, however, showed a drastic decrease in average words per minute from Phase One to the other two phases. For these writers, then, the writing process was slowed down by the use of the word processor. Undoubtedly, some of this slowdown can be attributed to the unfamiliarity of the subject with the machine and the word processing package, particularly in the case of Helen in Phase Two. Alex and Patricia, however, began Phase Two by typing rapidly and keeping their eyes on the keyboard except for

brief glances at the screen. Towards the middle of the
first essay, both these subjects began to look more and more
frequently to the screen; and by the time Phase Two ended,
both subjects were typing considerably more slowly and
looking to the screen every few words. In Phase Three an
even further decline in the average number of words per
minute for these two subjects was seen. Helen, on the other
hand, began Phase Two typing very slowly and inaccurately
and constantly kept her eyes on the computer screen.
Undoubtedly for her the mechanical act of writing by
computer slowed down the writing process, at least
initially, in Phase Two. As she wrote more with the word
processor, her typing speed picked up and she made fewer
typographical errors.

Of interest in the data contained in Table 25 is the
increase in average words per minute for Helen in Phase
Three. This increase might be explained in two ways: (a)
the mechanical aspects of using the word processor were more
automated, or (b) the voice synthesizer letter feedback
helped Helen monitor her typing, allowing her to proceed
more rapidly with the translation of her ideas to print.
Most likely, the increase in average words per minute for
Helen during Phase Three is explained in part by both these
possibilities.

Had all three subjects using the word processor been
slow and inaccurate typists to begin with, the decrease in

average words per minute for Phases Two and Three could be
attributed totally to the mechanical aspect of writing by
word processor. However, Alex and Patricia were fast and
accurate typists to begin with and were observed to be
almost "lured" into monitoring the computer screen as they
were writing, thereby decreasing the speed at which words
were produced. Visual monitoring on the computer screen
went beyond quick glances, furthermore. These subjects were
observed to spend long pauses staring at the screen almost
as if mesmerized. This staring at the product accounts for
the large increase seen in visual behaviors in Phases Two
and Three for these subjects, and it is more likely that the
increase in this visual behavior accounts for the decrease
in average words per minute rather than the mechanical act
of writing by word processor.

    Reformulation. All subjects practiced reformulation,
or editing, in all phases of writing. The frequency of
editing in relation to average words per minute remained
fairly constant over the three phases for all subjects, and
all subjects edited about the same amount. There was a 93%
overall accuracy rate in changes made to the product, and
all subjects demonstrated that they were able to find errors
in the product and successfully correct these errors. In
terms of editing then, all subjects showed fairly consistent
editing behaviors throughout the three phases of writing.
What appears to be have changed with the use of the word

processor, however, was the point at which these editing behaviors occurred. Although no patterns for this change in editing behaviors could be determined, it should be noted that editing seemed to be stimulated at different points when writing by word processor than when writing by hand.

Although there is indication in the data that editing behaviors may be activated at different points in the writing process when using a word processor, there is no evidence that editing increased when using this tool. This fact is interesting in that most researchers studying word processing, with the notable exception of Daiute (1986), Harris (1985), and Hawisher (1987), report a general increase in editing by students using the word processor. A possible explanation for this discrepancy is that when computers are brought into the writing classroom teachers and students alike are motivated to become more involved in writing as a process. The premise that most students prefer writing by word processor and find it exciting is supported by the literature and the data from this research. That teachers may be encouraged to teach writing more as a process given this increased student interest is highly possible. Teaching writing as a process of planning, translating, brainstorming, reviewing, and reformulating would most certainly change the reformulation behaviors of the students, and the word processor would allow for these reformulations to be carried out with more ease. In his

study on word processing in the composition classroom, Curtiss (1984) found that word processing was a valuable tool in the composition classroom when used in a nurturing composition milieu. Curtiss also concluded that four other elements were essential for this nuturing milieu: (a) a meaningful topic, (b) sufficient time to think and write, (c) a quiet place to write, and (d) feedback through dialogue. Since subjects in the present research expressed satisfaction with the writing topics, completed the essays well within the time frame, and felt relaxed in the research situation, it can be concluded that this research situation provided the first three elements outlined by Curtiss. Feedback through dialogue was not part of this study, however. Findings from Curtiss's study and this study support the conclusion that there is nothing inherent in word processing that encourages editing; that is, having a tool that makes reformulation easier does not automatically increase editing behaviors. Rather, it is the availability of the word processor plus a writing environment that supports and encourages reformulation that may produce an increase in this skill.

Errors. Errors in the product were found to generally decrease across phases for those subjects writing by word processor and increase for Concha. There was, however, a general decrease and increase, respectively, in the average number of words written across phases. When the average

number of words written per phase was divided by the average number of unresolved errors for each subject in each phase, a different pattern emerged; namely, those subjects writing by word processor showed a general increase in percentage of error remaining in the essays over phases while Concha showed a general decrease in percentage of essay remaining error. Since no confounding between type of essays and holistic scores was found, since each phase of writing contained one of each type of essay, and since all subjects wrote on the same topic in the same order, it is concluded that the increase in errors for Alex, Helen, and Patricia was somehow connected to writing with the word processor. Additionally, since no real change was found in aural behaviors across phases, it is concluded that this increase in errors was somehow related to the increase in visual behaviors, especially STP.

Holistic scores. With the exception of Patricia, holistic scores increased from Phase One to Two for all subjects. From Phase One to Three, however, a decrease in holistic scores was seen for those subjects writing by word processor while an increase was seen for Concha. The general trend, therefore, is that subjects using the word processor showed a general decline in overall quality of the product while Concha showed a general increase.

A negative relationship was found between percentage of essay remaining error and holistic scores in this group;

that is, the higher the percentage of essay remaining error, the lower the holistic score. If this relationship holds up, it stands to reason that those subjects increasing in percentage of error remaining in the essays across phases showed a general decrease in holistic scores while Concha showed a decrease in errors and increase in holistic score.

Given this relationship, the same conclusion is drawn for holistic scores as was for errors: word processing, at least in the short run, somewhat negatively affected the written product. This decline in the general quality of the product may have derived from the increase in the visual behavior of STP.

The Computer as Tool--Interaction and Reaction

Word processing. Throughout the literature on word processing, positive student reaction is reported as an almost constant conclusion. Results from this study add yet another piece of evidence that people like writing by word processor. The reasons given by the three subjects using word processing for preferring this medium for writing included (a) having a "clean" copy of the essay, i.e., a copy free of scratched out words and insertions; (b) being able to see the whole product without shuffling papers around; (c) enjoying writing more; (d) being able to "see" the product more clearly; (e) being able to go faster and make changes easier; (f) improving the quality of the

product; and (g) being able to immediately see how changes to the document looked.

With the exception of reasons (e) and (f), preference for writing by this medium parallel reasons given in the literature and could be considered viable reasons for preferring to write by word processor. It should be noted, however, that the second reason, being able to see the whole product without shuffling papers, resulted from the fact that subjects in this study did not write long essays and, for the most part, the entire essay fit onto one screen. Subject reaction may have varied had the essays been longer and taken up more than one screen.

Reasons (e) and (f) are interesting in that they are perceived advantages rather than real ones. As has been related earlier in this discussion, subjects wrote slower and made approximately the same number of changes to the product, and general quality of the product went down somewhat while writing with the computer.

A possible explanation for the discrepancy between perceived and real advantages of writing by word processor is that students felt more comfortable with writing in Phases Two and Three because they were both more used to the research situation and to writing in English. This increased comfort could cause them to perceive the process of writing as quicker and better. It may also be, as suggested in the literature, that students using word

processing feel more in control of the writing process and this increased sense of control may be reflected in their attitude toward the writing process and quality of the product. It is obvious that this sense of control could be highly beneficial in the long run for the writing process.

Another perceptual phenomenon that occurred across the three subjects using word processing was their belief that they could "see" errors better on the computer screen. Although data from this study support the conclusion that perception on the computer monitor is different from perception when viewing work written by pen and paper, there is evidence that errors were seen better only in the case of spelling errors. The fact that spelling was attended to more frequently in Phases Two and Three suggests that the computer screen may indeed change visual perception during writing; but for this group, reviewing of the product seemed to center around the word and, therefore, the only errors "seen" and monitored also centered around the word. Given a more experienced group of writers who review on a more global level, results could be different.

Voice synthesization. Voice synthesized feedback was seen to be of no benefit in the writing process or to the written product for Alex and Patricia. In fact, Patricia elected not to use letter feedback at all and used delayed feedback only twice; and Alex found the voice synthesizer feedback not understandable and inhibiting in the writing

process, interfering with his train of thought.   There is
evidence from the data on Helen, however, that this outside
aural feedback helped her monitor her written work and find
errors.   This monitoring was activated for different
purposes, depending on which type of voice synthesized
feedback was being used.   When Helen used immediate letter
feedback, for example, typographical errors were noted more
rapidly than they were in Phase Two, when only word
processing was used, and these typographical errors were
corrected immediately and writing was continued.   This
factor may help account for the rise in average words per
minute for Helen from Phase Two to Phase Three.

   A different reaction was seen for Helen when delayed
rereading of the product by the voice synthesizer was
used.   While the voice synthesizer reread the product, Helen
followed along the screen visually and on several occasions
discovered errors in her product after the voice synthesizer
had read the part of the product in which the error was
contained.   These errors were then corrected.   Helen
reported that what she had written sounded different when
the voice synthesizer was reading it back to her, and this
allowed her to find errors in style that she had not
discovered before.   Unfortunately, Helen used delayed
feedback in only one essay, so gains in overall quality of
the essays in Phase Three were small.

The fact that Helen liked and benefitted from voice synthesizer feedback during writing while Alex and Patricia found no uses for it can be explained in part by both mechanical skills at the keyboard and attitude. Whereas both Alex and Patricia typed quickly, Helen was a slow typist. Letter feedback from the voice synthesizer was delayed by a split second from typing the letter; and while this feedback preceded the typing of the next letter for Helen, it arrived at approximately the same time as the next letter was being pressed for Alex and Patricia. This, consequently, caused confusion and interference in thought for Alex and Patricia, and for this reason the letter feedback was left almost exclusively off in their writing. Helen, on the other hand, received immediate aural feedback of the letter she typed and could monitor it before the next stroke on the keyboard. Whereas, then, Alex and Patricia experienced frustration in terms of using the voice synthesizer, Helen found a reward in its use. These differential experiences may have affected the subjects' attitudes toward other capabilities of the voice synthesizer, causing Helen to respond more positively to delayed feedback while causing Alex and Patricia to reject delayed feedback.

In the following chapter conclusions and implications of the research findings will be presented.

CHAPTER V
CONCLUSIONS AND IMPLICATIONS

Overview

Six major research questions were addressed in this study:

1. What visual and aural behaviors are used by the subjects when writing utilizing the traditional paper and pen method?

2. What function(s) do these visual and aural behaviors have in the writing process?

3. Does writing by word processor change the nature or frequency of these visual and aural behaviors?

4. Does aural feedback provided by a voice synthesizer reinforce or enhance visual feedback during writing?

5. Is the written product affected by a change in the writing medium?

6. What is subject reaction to using a computer as the tool in the writing process?

In order to answer these questions, four NELB adults unskilled in writing in English were observed throughout the entire writing process during the writing of nine essays. The theme of the essays, the order in which the essays were written, and the writing schedules were the same for all

four subjects. The only variable which was deliberately
manipulated was the medium by which the essays were written.

In Phase One, that is, in the writing of the first
three essays, all subjects wrote using the traditional paper
and pen method. In Phase Two, essays four through six,
three of the four subjects wrote by word processor while a
fourth subject continued to write by paper and pen. In
Phase Three, the last three essays, the three subjects using
word processing continued to write by this medium but voice
synthesizer feedback was also made available. The fourth
subject continued to write by paper and pen.

Observational data were recorded on a continuous basis
for all subjects during all phases of writing. These
observational data were supplemented by audiotaping of the
writing sessions, a nonscheduled standardized interview,
nonstandard interviews, a debriefing interview, and
collection and scoring of the products. The findings from
these data were presented and discussed in Chapter IV. In
this chapter a set of conclusions concerning the data
obtained in this research will be provided and the
implications these findings have for both teaching and
further research will be discussed.

Conclusions

Conclusions from the study will be presented below and
will be organized as a response to each of the six research
questions.

What Visual and Aural Behaviors Were Used by the Subjects
When Writing Utilizing the Traditional Paper and Pen Method?

The auditory and visual modes were demonstrated to be
important in the writing process for this group of subjects,
but use of the visual mode was predominant. The visual
behaviors that occurred in the writing by paper and pencil
of all these subjects were (a) local rereading and scanning,
i.e., rereading and scanning in the general writing area;
(b) global scanning, i.e., rapid scanning of large parts of
the essay; (c) global rereading, i.e., deliberate rereading
word by word of large parts of the essay; (d) staring at the
product, particularly in the general writing area; and (e)
staring off the product, for example, staring into the air,
looking at directions, looking at hands and so forth.

Individual differences were seen in the frequency of
each type of behavior and at what point in the writing
process the behavior was activated, but all subjects used
all behaviors while writing by paper and pen.

Aural behaviors were less frequently observed than
visual behaviors but were shown to be important for the
writing process of this group of subjects. The aural
behaviors observed included (a) direct questions to the
researcher, seeking advice or information; (b) speaking-
writing, i.e., writing and saying a word simultaneously; (c)
subvocalizations, e.g., whispering, murmuring, etc.; (d)

nonverbal vocalizations, e.g., sighing, coughing, etc.; (e) comments on writing or the product; and (f) oral rereading.

Numerous individual differences were found in frequency of aural behaviors during writing and in types of aural behaviors used, but all subjects showed at minimum a moderate use of aural behaviors during writing by paper and pen.

What Function(s) Did These Visual and Aural Behaviors Have in the Writing Process?

The visual behaviors of local rereading and scanning, global scanning, global rereading, and a part of staring at the product were used primarily to monitor, or review, the product for (a) generation of ideas or (b) reformulation. A part of the visual behavior of staring at the product and all of the visual behavior of staring off the product were used when the subjects were thinking and planning.

While a significant part of the visual behaviors were used to monitor work in order to generate more ideas, aural behaviors were used almost exclusively to monitor, or review, the written product for the purpose of reformulation. A notable exception to this, however, was speaking-writing, which was frequently used to help the subject complete the spelling of a word or "sound out" words as they were being written.

Did Writing by Word Processor Change the Nature or Frequency
of These Visual and Aural Behaviors?

Whereas most visual behaviors remained fairly
consistent when subjects wrote by word processor, staring at
the product was seen to increase dramatically while staring
off the product declined. This increase in staring at the
product was due to increased monitoring of the written
product. There was, however, no resultant increase in
generation of words or in reformulation. In fact, the
average number of words written overall and the average
number of words written per minute were seen to decrease
substantially upon changing the writing medium to a word
processor. These decreases were a result primarily of the
increase in visual monitoring of the product. Furthermore,
although reformulation occurred at approximately the same
rate as when subjects wrote by hand, there is some
indication in the data that the increased visual monitoring
helped subjects find word level errors, primarily spelling
and typographical errors. This finding suggests that visual
perception on a computer screen is different from visual
perception of pen on paper. There is also some indication
that monitoring for reformulation purposes may be activated
at different points in the writing process when writing by
word processor.

Aural behaviors increased in frequency initially when subjects wrote by word processor but gradually decreased again to approximately the same frequency level as when subjects wrote by the traditional paper and pen method. The temporary increase in aural behaviors was seen as resulting from the novelty effect; that is, the uniqueness and newness of writing by word processor stimulated aural behavior, but as the newness wore off, aural behaviors decreased to approximately the same level as when the subjects were writing by paper and pen. Aural behaviors, then, were shown to remain constant despite a change in the writing medium.

Did Aural Feedback Provided by a Voice Synthesizer Reinforce or Enhance Visual Feedback During Writing?

Two of the three subjects writing by computer made no, or sporadic, use of voice synthesizer letter feedback. After initial instruction in voice synthesizer feedback, one of these two subjects decided not to use this capability at all in the writing of the three essays in Phase Three and immediately turned letter feedback off before beginning the essays and left it off. The other subject "experimented" with voice synthesizer letter feedback but left it off during the writing of most of the three essays. This subject reported an interruption in thinking caused by letter feedback. Voice synthesizer delayed feedback of

words or entire portions of the product was used a few times by both of these subjects with no apparent results. It should be noted, however, that because immediate letter feedback distracted these skilled typists, they reacted negatively to other voice synthesizer capabilities. Had this negative response been avoided by omitting immediate letter feedback from the research situation, other results might have been observed.

Data provided by the third subject, on the other hand, suggest that voice synthesizer feedback may reinforce, or even improve upon, visual monitoring during the writing process for some writers. The letter feedback allowed this subject to monitor her typing and correct typographical and spelling errors more rapidly than she did when writing by word processor alone. Additionally, delayed rereading of the product by the voice synthesizer helped her find errors in the product that had not been observed when using visual monitoring alone. For this writer, then, simultaneous visual and outside aural feedback proved to be more advantageous to reformulation than visual feedback alone.

Was the Written Product Affected by a Change in the Writing Medium?

Though no causal relationship is suggested, an increase in percentage of essay remaining error was seen in those subjects writing by word processor. A general decline in

holistic scores was also observed for those subjects writing by word processor; however, a negative relationship was observed between number of errors and holistic scores, and, therefore, the decline in holistic scores is seen as a result of increase in errors.

The patterns in these data suggest that although the word processor per se did not cause an increase in percentage of essay remaining error, it was responsible for a change in the writing process that caused an increase in errors. The most visible change in the writing process observed in those subjects writing by word processor was an increase in staring at the product; and, therefore, it is concluded that increased focus on the product might somehow be responsible for the increase in errors.

A second change seen in the written product when subjects wrote by word processor was a decrease in the number of words written. Whereas the subject who wrote all essays by paper and pen gradually increased the number of words written over the nine essays, those subjects writing by word processor decreased the number of words written by as much as two-thirds. This decrease in number of words written is seen as directly related to the increase in the visual behavior of staring at the product.

The voice synthesizer used in conjunction with the word processor was seen to affect the written product in several ways:

1.   Letter feedback helped increase the number of words written by Helen, a slow and inaccurate typist, in the last three essays.

2.   Delayed rereading of the essay by voice synthesizer was used in only one essay by Helen and was shown to help her find errors that she had not found through visual monitoring alone.   Because delayed feedback was used in only one essay, its potential for affecting the written product was greatly reduced.   Had it been used consistently by Helen, overall effects on the product might have been observed.

3.   Letter feedback distracted the skilled typists.

What Was Subject Reaction to Using the Computer as the Tool in the Writing Process?

All three subjects using the computer displayed positive attitudes toward using the word processor as the medium to write their essays.   They not only preferred writing by word processor to writing by hand, but also felt that it helped them write better.   As discussed previously, however, there was a general decline in overall quality of the products rather than a gain when subjects wrote by word processor.   This discrepancy between perceived and real benefits of writing by word processor suggests that the subjects felt more in command of the writing process when writing by word processor and that this increased sense of

control resulted in their viewing the writing process more
positively.

Subjects' reasons for preferring writing by word
processor included (a) having a "clean" copy of the essay,
(b) being able to see the whole product without shuffling
papers, (c) enjoying writing more, (d) being able to "see"
the product more clearly, (e) being able to write faster and
make changes easier, (f) improving the quality of the
product, and (g) being able to immediately see how changes
to the document looked. Like improving the quality of the
product, being able to write faster was determined to be a
perceived rather than real advantage of writing by word
processor for this group of subjects. Again, this
discrepancy might be explained in terms of increased sense
of control in the writing process. Because subjects were
more positively and actively involved in writing when using
the word processor, they perceived the process as more
rapid.

Whereas subjects were unanimous in their positive
reactions towards writing by word processor, they were
almost at polar extremes in their reactions towards writing
by word processor with voice synthesizer feedback. One
subject rejected letter feedback during instruction on its
use and used delayed feedback only twice, and another
subject experimented a little with both immediate letter
feedback and delayed feedback and then rejected them. The

third subject thought she would dislike using the voice synthesizer but used it anyway. By the time the three essays were finished, she liked voice synthesizer feedback so much that she said she would write with it all the time were it available to her.

Reasons given for rejecting the voice synthesizer feedback were the following:

1. The subject could not understand the voice.

2. The letter feedback interfered with the thought process.

Reasons given by the third subject for liking voice synthesizer feedback included:

1. It helped her find mistakes in her essays.

2. It helped her monitor the product for style.

3. It helped her correct spelling and typographical errors more quickly.

4. It made the written work sound "different" than when she read back to herself, and this gave her a clearer perspective in her writing.

5. It was fun.

Implications

Implications for Research

According to Borg and Gall (1983), research has two basic purposes: (a) to describe a phenomenon and (b) to explore relationships in variables. In order to fulfill the second purpose of research, there needs to be sufficient

enough understanding of the phenomena being studied to form hypotheses about relationships among the variables.

In the study of the writing process not only is the relationships among variables still unclear, but all the variables which are at play during writing have yet to be determined. The major reason this is true is that writing is a complex psychological, sociological, linguistic, and perhaps even individualistic process that does not readily lend itself to simplistic classification and description. Because of the complexity of the phenomenon under study, research on the writing process by necessity has been exploratory in nature, with researchers looking at many variables in order to understand what part each plays in the writing process. Through this exploratory research there has begun to evolve a better understanding of the writing process, allowing those in the field to begin to ask themselves new and more directed questions, and these new questions have been the "springboard" to other exploratory studies. Through this process of exploration and formulation of further research questions, an accurate description and theoretical models of the writing process will eventually evolve and relationships between variables can then be studied.

At the height of interest in describing and focusing on the writing process has entered another variable that itself

may somehow affect the writing process, namely, the computer as a tool for writing. The rapid embracing of this technology in the writing classroom has given rise to yet another set of questions that need to be explored. It is from this new set of questions that the present research originated.

Steinberg (1980) suggested that in order to understand the writing process, the subsets should be broken down into the simplest terms possible in order to study them. In this study this researcher attempted to do just that. This researcher's goal, in the broadest sense, was to describe two modal behaviors in the writing of a group of subjects and to describe what changes took place in these behaviors when changing the writing medium. As with all exploratory research, from this study new questions have been generated, many of which offer rich opportunity for further research.

Questions concerning visual and aural behaviors during writing by the traditional paper and pen method remain to be answered. Are, for example, the visual and aural behaviors during writing the same for other groups of subjects; e.g., how do experienced NELB adult writers compare in these behaviors to unskilled NELB adult writers, and how do native English speakers compare? Do other types of writers use visual and aural behaviors for the same purposes? Does the frequency of these behaviors have anything to do with the

quality of the product; e.g., is it possible that Helen's comparatively elevated holistic scores were related to her very frequent use of aural monitoring?

Questions concerning aural and visual behaviors while writing by computer also must be asked and answered. Are similar changes in visual and aural behaviors during writing by computer found for other types of subjects? Are these changes the same for subjects who are being taught in a process-oriented classroom? How might these behaviors be affected by some quality inherent in word processing or voice synthesization; for example, would these behaviors be different were the configuration of visual feedback changed, such as having double spacing instead of single spacing or having black letters on green background, or were aural feedback different, such as a slowing down or speeding up of the voice or the use of a different kind of voice synthesizer?

The area of voice synthesizer aural feedback during writing provides yet many more intriguing questions for further research. How might long term use of voice synthesizer aural feedback affect the writing process for someone who uses it consistently? Were immediate letter feedback eliminated for skilled typists, would these writers have a more positive attitude toward delayed feedback and would their writing benefit from its use? Is aural feedback

provided by an outside source, albeit a far from perfect one, more helpful for aural monitoring during writing than one's own voice? Would aural feedback from another person be more helpful?

This research has also stimulated more generalized questions concerning the use of a computer as a tool in the writing process that are worthy of research. For example, what other aspects of the writing process are changed by using this tool; e.g., are types of reformulations different than when writing by hand? Is there a decrease in average words per minute for subjects writing by word processor in a process-oriented classroom? What are the long term effects on the writing process of using a word processor in the writing classroom; e.g., do students maintain interest in using the word processor over time and does this in any way affect the process of writing or the quality of the product?

The questions evolving from this study indicate that the study of the writing process and how this process may be affected by technology is a rich and exciting area for exploration. They also suggest that many basic questions remain unanswered and point, therefore, to the necessity of further exploratory and descriptive research. Only when all the basic questions have been answered can those in the field begin to effectively formulate theoretical models of the writing process and test relationships among the variables.

Implications for Teaching

Though this study was exploratory in nature, results provide several important tentative implications for pedagogy.

First of all, in the literature review it was pointed out that aural language is a mark of the writing of unskilled writers and children. This study, however, suggests that aural behaviors, though they may be characteristic of unskilled writers, serve a distinct and important function; namely, they help the unskilled writer monitor work for purposes of reformulation. As Shaughnessy (1977) stated, basic writers tend to see what they think they have written rather than what has actually been written. Perhaps, then, aural feedback provides for the unskilled writer a second monitor during review and allows errors to be found that are "missed" during visual review. If this is indeed what is happening, then encouraging unskilled writers to use aural monitoring could be advantageous to their writing.

Secondly, the data on voice synthesizer feedback suggest that for some writers outside aural feedback of their writing allows them to monitor their work from a more objective perspective. This objectivity may help them find errors in style that are not found when monitoring their work themselves. Students may profit, therefore, by having their work read aloud during the intermediate stages of

writing, especially NELB students who may mispronounce words and falter in rereading aloud their work and thus not profit from their own aural feedback.

Third, the direct questions asked by subjects during writing suggest that for unskilled NELB writers lack of knowledge in the target language slows down the writing process. Because the subjects often had to stop the translation phase of writing to check vocabulary, spelling, and, less frequently, other aspects of language, they wrote fewer words, and less fluidly, than might have occurred were they secure in their knowledge of English. Though the exact concerns were different, however, these subjects responded to writing in much the same way as the native English-speaking basic writers described by Shaughnessy (1977). They also responded similarily to the unskilled native English-speaking writers studied by Perl (1979) and Pianko (1977). A characteristic found among all these writers, furthermore, was that revision centered on the lexical and syntatic aspects of language.

These factors, then, imply that commonalities exist in the writing process of all unskilled writers, be they bilingual or monolingual, and point to associative writing (writing down whatever comes to mind in the order that it comes) as being typical of unskilled writers, as suggested by Bereiter (1980). Knowing that students are at the associative writing stage is important for teachers of

composition. First of all, having this knowledge, teachers can assign writing tasks that fit associative writing rather than some other type of writing, thereby lessening cognitive demands on the writer. Also, teachers can put less focus on lexical and syntatic errors in the writing classroom, stressing, rather, the importance of writing as a communication of ideas. Students can even be taught to "skip" trouble areas when transcribing their ideas and come back with dictionaries, grammars, etc. to these areas to fill in the missing details in subsequent drafts. In short, knowing where our students are in the writing process is the first step in knowing how to teach composition.

A fourth implication of this research for pedagogy is that using a word processor without a complementary process-oriented environment for writing may have negative effects on the quality of the experience and the product. There is nothing inherent in word processing that increases reformulation, but this research points to there being something in the visual feedback provided by a computer screen that causes writers to focus more on the product and reread more often. This increase in rereading seemed to go nowhere, however, and it is most probably because the subjects lacked the knowledge and expertise to go further. Lacking the knowledge to reformulate further yet spending more time on reviewing cut down on the translation stage of writing without improving overall quality of the product.

Had subjects had the knowledge and expertise to channel this increased visual review, different results may have come about. Teachers, then, should be aware that word processing seems to work as an asset to the writing process only when it is accompanied by a process-oriented environment and that when used in the writing process without that environment it may negatively affect the product.

A fifth implication of this research is that slow typists may benefit from voice synthesizer letter feedback, allowing the monitoring of their typing to be carried out more quickly and thereby allowing the translation stage of writing to be interrupted less often. Having voice synthesizer letter feedback available for use with word processing could be beneficial for those students lacking sufficient keyboard skills.

Finally, an important implication of this study for teaching is that, as Gould (1980) suggested, a change in the writing medium may affect the writing process and even, somewhat, the product; but, in general, students maintain their general level of writing ability despite the medium used. Having students use a computer to write, therefore, will not change them overnight into flawless writers. It may, nonetheless, make the writing process more enjoyable for them and give them a sense of control in writing. A positive attitude and sense of control in the writing process coupled with an interactive process-oriented

classroom and a machine that facilitates the process could, indeed, over the long run change not only the process of writing, but also the quality of the writing product.

Name:

Age:

Education:

Field of Study:

Placement Score:

Year/Months in English-Speaking Country:

Language Background:

Years/Months Studying English:

Types of English Programs:

Place of Birth:

Other Countries Lived In:

Years/Months in Other Countries:

Father's Occupation:

Mother's Occupation:

Other Family Members and Their Occupations:

Home Education:

Self-Described Difficulties with English:

Writing History:

Self-Described Learning Modality:

REFERENCES

Alatis, J. (1986). The role of English as a second
    language in bilingual education. In A. F. Hawkins
    (Chair), A report of the compendium of papers on the
    topic of bilingual education (Serial No. 99-R, pp.
    16-27). Committee on Education and Labor, House of
    Representatives, 99th Congress, 2D Session.

Andersson, T., & Boyer, M. (1978). Bilingual schooling in
    the United States (2nd ed.). Austin, TX: National
    Educational Laboratory Publishers, Inc.

Asher, J. J. (1966). The learning strategy of the total
    physical response: A review. Modern Language Journal,
    50, 79-84.

Asher, J. J. (1969a). The total physical response approach
    to second language learning. Modern Language Journal,
    53, 3-17.

Asher, J. J. (1969b). The total physical response
    technique of learning. The Journal of Special
    Education, 3, 253-262.

Barnitz, J. G. (1982). Orthographies, bilingualism and
    learning to read English as a second language. The
    Reading Teacher, 35, 560-567.

Barritt, L. S., & Kroll, B. M. (1978). Some implications
    of cognitive-developmental psychology for research in
    composing. In C. R. Cooper & L. Odell (Eds.), Research
    on composing: Points of departure (pp. 49-57).
    Urbana, IL: National Council of Teachers of English.

Becker, H. J. (1982). Microcomputers in the classroom--
    Dreams and realities (Report No. 319). Baltimore,
    MD: The Johns Hopkins University, Center for Social
    Organization of Schools.

Bell, T. E. (1983a, April). Learning to win. Personal
    Computing, pp. 134-141.

Bell, T. E. (1983b, June). My computer, my teacher.
    Personal Computing, pp. 120-127.

229

Bereiter, C. (1980). Development in writing. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 73-93). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Bialystok, E. (1980). A theoretical model of second language learning. In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 199-212). Boston: Little, Brown and Company.

Bialystok, E. (1981). The role of conscious strategies in second language proficiency. Modern Language Journal, 65, 24-35.

Blau, S. (1983). Invisible writing: Investigating cognitive processes in composition. College Composition and Communication, 34, 297-312.

Bolinger, D. (1968). Aspects of language. New York: Harcourt, Brace & World, Inc.

Borg, W. R., & Gall, M. D. (1983). Educational research: An introduction (4th ed.). New York: Longman.

Briggs, L. J. (1968). Learner variables and educational media. Review of Educational Media, 38, 160-176.

Britton, J. (1978). The composing processes and the functions of writing. In C. R. Cooper & L. Odell (Eds.), Research on composing: Points of departure (pp. 13-28). Urbana, IL: National Council of Teachers of English.

Britton, J., Burgess, T., Martin, N., McLeod, A., & Rosen, H. (1975). The development of writing abilities (11-18). London: Macmillan Education, Ltd.

Brown, B. E. (1983). Reflections on recent research in composition. English Journal, 72(5), 51-54.

Bruce, B., Michaels, S., & Watson-Gegeo, K. (1985). How computers can change the writing process. Language Arts, 62, 143-149.

Carter, J. (1984). Instructional learner feedback: A literature review with implications for software development. The Computing Teacher, 12(2), 53-55.

Cavin, G. E. (1983). Readin', ritin' and revision. The Clearing House, 57, 119-123.

Chomsky, N. (1965). Aspects of the theory of syntax. Cambridge, MA: M.I.T. Press.

Collins, J. L., & Williamson, M. M. (1981). Spoken language and semantic abbreviation in writing. Research in the Teaching of English, 13, 23-35.

COMSIS Corporation. (1984). Review of the state-of-the-art of educational technologies implemented in programs serving LEP students funded by the Department of Education (Contract No. 9-83-1-0529). Washington, DC: U.S. Department of Education.

Connors, R. J. (1983). Composition studies and science. College English, 45, 1-20.

Cooper, G. C. (1980). Everyone does not think alike. English Journal, 69(4), 45-50.

Cooper, J. C., & Gaeth, J. H. (1967). Interactions of modality with age and with meaningfulness in verbal learning. Journal of Educational Psychology, 58, 41-44.

Cory, S. (1983). A 4-stage model of development for full implementation of computers for instruction in a school system. The Computing Teacher, 11(4), 11-16.

Croft, K. (Ed.). (1980). Readings on English as a second language for teachers and teacher trainees (2nd ed.). Boston: Little, Brown and Company.

Cronnell, B. (1983). Dialect and writing: A review. Journal of Research and Development in Education, 17(1), 58-64.

Cubillos, E. M. (1983-1984). What is bilingual education CAI? Bilingual Journal, 8(1 & 2), 8-12, 48.

Cuevas, G. J. (1983-1984). Microcomputers in the bilingual classroom. Bilingual Journal, 8(1 & 2), 22-24.

Cumming, G., & McCorriston, M. (1981). Evaluation of computer speech for use with CAI for young children. Journal of Computer-Based Instruction, 8, 22-27.

Cummins, J. (1981). Four misconceptions about language proficiency in bilingual education. NABE Journal, 5(3), 31-45.

Cummins, J.   (1987).   Empowering minority students (Teacher Training Monograph Series No. 5).   Gainesville, FL: University of Florida, Multilingual Multicultural Education Program.

Curtiss, D. H.   (1984).   The experience of composition and word processing: An ethnographic, phenomenological study of high school seniors.   Dissertation Abstracts International, 45, 1021-A. (University Microfilms No. 84-16,862)

Daiute, C. A. (1981).   Psycholinguistic foundations of the writing process.   Research in the Teaching of English, 15, 5-22.

Daiute, C. (1986).   Physical and cognitive factors in revising: Insights from studies with computers. Research in the Teaching of English, 20, 141-159.

Dehn, M. (1979).   Children's strategies in learning to read and write: An examination of the learning process. The Reading Teacher, 33, 270-277.

Denzin, N. K. (1978).   The research act: A theoretical introduction to sociological methods (2nd ed.). New York: McGraw-Hill Book Company.

Dilworth, C. B., Reising, R. W., & Wolfe, D. T.   (1978). Language structure and thought in written composition: Certain relationships.   Research in the Teaching of English, 12, 97-106.

Dudley-Marling, C. C. (1985).   Microcomputers, reading, and writing: Alternatives to drill and practice.   The Reading Teacher, 38, 388-391.

Dyson, A. H. (1983).   The role of oral language in early writing processes.   Research in the Teaching of English, 17, 1-30.

Edelsky, C. (1982).   Writing in a bilingual program: The relation of L1 and L2 texts.   TESOL Quarterly, 16, 211-228.

Edelsky, C. (1983).   Segmentation and punctuation: Developmental data from young writers in a bilingual program.   Research in the Teaching of English, 17, 135-156.

Edling, J. V. (1968). Educational objectives and educational media. Review of Educational Research, 38, 177-194.

Emig, J. (1971). The composing processes of twelfth graders. Urbana, IL: National Council of Teachers of English.

Emig, J. (1978). Hand, eye, brain: Some "basics" in the writing process. In C. R. Cooper & L. Odell (Eds.), Research on composing: Points of departure (pp. 59-71). Urbana, IL: National Council of Teachers of English.

Emmett, A. (1984, May). Picking the perfect word processor. Personal Computing, pp. 112-120, 189, 192, 193.

Engberg, R. E. (1983). Word processors in the English classroom. Computers, Reading, and Language Arts, 1(1), 17-19.

Ervin-Tripp, S. M. (1974). Is second language learning like the first? TESOL Quarterly, 8, 111-127.

Esau, H., & Keene, M. L. (1981). A TESOL model for native-language writing instruction: In search of a model for the teaching of writing. College English, 13, 694-710.

Falk, J. S. (1979). Language acquisition and the teaching and learning of writing. College English, 41, 436-447.

Fisher, F. D. (1982). Computer-assisted education: What's not happening? Journal of Computer-Based Instruction, 9, 19-27.

Fisher, G. (1983). Where CAI is effective: A summary of the research. Electronic Learning, pp. 82, 84.

Flanigan, M. C. (1980). Composition models: Dynamic and static imitations. Theory Into Practice, 19, 211-219.

Flower, L. (1979). Writer-based prose: A cognitive basis for problems in writing. College English, 41, 19-37.

Flower, L., & Hayes, J. (1977). Problem-solving strategies and the writing process. College English, 39, 449-461.

Flower, L., & Hayes, J. (1980). The cognition of discovery: Defining a rhetorical problem. College Composition and Communication, 31, 21-32.

Flower, L., & Hayes, J. (1981). The pregnant pause: An inquiry into the nature of planning. Research in the Teaching of English, 15, 229-243.

Forman, D. (1982). Search of the literature. The Computing Teacher, 9(5), 37-51.

Friedman, H. (1983, July). Variable speech. Creative Computing, pp. 122-129.

Gass, S. (1983). The development of L2 intuitions. TESOL Quarterly, 17, 273-291.

Geoffrion, L. D. (1982-1983). The feasibility of word processing for students with writing handicaps. Journal of Educational Technology Systems, 11, 239-250.

Ginther, D. W. (1983). Micro's are talking back in the classroom: The promise of speech technology in education. Technological Horizons in Education Journal, 12(2), 105-107.

Gould, J. D. (1980). Experiments on composing letters: Some facts, some myths, and some observations. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 97-127). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Graves, D. H. (1973). Children's writing: Research directions and hypotheses based upon an examination of the writing processes of seven year old children. Dissertation Abstracts International, 34, 6255-A. (University Microfilms No. 74-83, 75)

Grayson, L. P. (1984). An overview of computers in U.S. education. Technological Horizons in Education Journal, 12(1), 78-87.

Hakuta, K., & Snow, C. (1986). The role of research in policy decisions about bilingual education. In A. F. Hawkins (Chair), A report of the compendium of papers on the topic of bilingual education (Serial No. 99-R, pp. 28-40). Committee on Education and Labor, House of Representatives, 99th Congress, 2D Session.

Halpern, J. W., & Liggett, S. (1984). Computers & composing: How the new technologies are changing writing. Carbondale and Edwardsville, IL: Southern Illinois University Press.

Halpern, J. W., & Mathews, D. (1980). Helping inexperienced writers: An informal discussion with Mina Shaughnessy. English Journal, 69(3), 32-37.

Halsall, S. W. (1985). An ethnographic account of the composing behaviors of five young bilingual children. Dissertation Abstracts International, 46, 2555-A. (University Microfilms International No. 85-23, 835)

Harris, J. (1985). Student writers and word processing: A preliminary evaluation. College Composition and Communication, 36, 323-330.

Hawisher, G. E. (1987). The effects of word processing on the revision strategies of college freshmen. Research in the Teaching of English, 21, 145-159.

Hayes, J. R., & Flower, L. S. (1980). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 3-30). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Hennings, D. G. (1983). Words processed here--Write with your computer. Phi Delta Kappan, 65, 122-124.

Hudelson, S. (1984). Kan yu ret an rayt en ingles: Children become literate in English as a second language. TESOL Quarterly, 18, 221-238.

Humes, A. (1983). Research on the composing process. Review of Educational Research, 53, 201-216.

Kaplan, R. B. (1980). Cultural thought patterns in inter-cultural education. In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 399-418). Boston: Little, Brown and Company.

King, M. L. (1980). Learning how to mean in written language. Theory Into Practice, 19, 163-169.

King, M. L. (1984). Language and school success: Access to meaning. Theory Into Practice, 23, 175-182.

Kirby, D. R., & Liner, T. (1980). Revision: Yes, they do it. Yes, you can teach it. _English Journal_, _69_(3), 41-45.

Knepler, M. (1984). Impromptu writing to increase fluency. _TESOL Newsletter_, Writing and Composition, Supplement 1, _18_, 15-16.

Krashen, S. D. (1976). Formal and informal linguistic environments in language acquisition and language learning. _TESOL Quarterly_, _10_, 157-168.

Krashen, S. D. (1980). The monitor model for adult second language performance. In K. Croft (Ed.), _Readings on English as a second language for teachers and teacher trainees_ (pp. 213-221). Boston: Little, Brown and Company.

Krashen, S. D. (1982). Theory versus practice in language training. In R. W. Blair (Ed.), _Innovative approaches to language teaching_ (pp. 15-30). Rowley, MA: Newbury House Publishers, Inc.

Kuhn, T. S. (1970). _The structure of scientific revolutions_ (2nd ed.). Chicago: University of Chicago Press.

Kulik, J. A., Bangert, R. L., & Williams, G. W. (1983). Effects of computer-based teaching on secondary school students. _Journal of Educational Psychology_, _75_, 19-26.

Kulik, J. A., Kulik, C., & Cohen, P. A. (1980). Effectiveness of computer-based college teaching: A meta-analysis of findings. _Review of Educational Research_, _50_, 525-544.

Levin, J. A., & Boruta, M. J. (1983). Writing with computers in classrooms: "You get exactly the right amount of space!" _Theory Into Practice_, _22_, 291-295.

Levin, R., & Doyle, C. (1983). The microcomputer in the writing/reading/study lab. _Technological Horizons in Education Journal_, _10_(4), 77-79, 100.

Levinger, L. (1978). The human side of illiteracy. _English Journal_, _67_(8), 26-29.

Liebling, C. R. (1984). Creating the classroom's communicative context: How teachers and microcomputers can help. Theory Into Practice, 23, 232-238.

Lund, D. D. (1983). A computer aided instruction program in sentence rhetoric: Theory and application. Dissertation Abstracts International, 44, 2459-A. (University Microfilms No. 83-25, 581)

Marcus, S., & Blau, S. (1983). Not seeing is relieving: Invisible writing with computers. Educational Technology, 23(4), 12-15.

Matsuhashi, A. (1981). Pausing and planning: The tempo of written discourse production. Research in the Teaching of English, 15, 113-134.

McComb, G. (1982, December). Speech, speech! Creative Computing, pp. 120-130.

Mischel, T. (1974). A case study of a twelfth-grade writer. Research in the Teaching of English, 8, 303-314.

Monod-Cassidy, H. (1966). The new audio-visual student. Modern Language Journal, 50, 15-18.

Moran, C. (1983). Word processing and the teaching of writing. English Journal, 72(3), 113-115.

Mosenthal, P. (1983). Defining classroom writing competence: A paradigmatic perspective. Review of Educational Research, 53, 217-251.

Murray, D. M. (1978a). Internal revision: A process of discovery. In C. R. Cooper & L. Odell (Eds.), Research on composing: Points of departure (pp. 85-103). Urbana, IL: National Council of Teachers of English.

Murray, D. M. (1978b). Teach the motivating force of revision. English Journal, 67(7), 56-60.

Nattinger, J. R. (1984). Communicative language teaching: A new metaphor. TESOL Quarterly, 18, 391-407.

O'Brien, P. (1984). Using microcomputers in the writing class. The Computing Teacher, 11(9), 20-21.

Odell, L. (1980). Teaching writing by teaching the process of discovery: An interdisciplinary enterprise. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 139-154). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Odell, L., Cooper, C. R., & Courts, C. (1978). Discourse theory: Implications for research in composing. In C. R. Cooper & L. Odell (Eds.), Research on composing: Points of departure (pp. 1-12). Urbana, IL: National Council of Teachers of English.

Paivio, A. (1978). A dual coding approach to perception and cognition. In H. L. Pick & E. Saltzman (Eds.), Modes of perceiving and processing information (pp. 39-51). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Papert, S. (1980). Mindstorms: Children, computers, and powerful ideas. New York: Basic Books, Inc.

Paulston, C. B. (1982). Recent developments in research in bilingual education in the United States. Los Angeles, CA: Evaluation, Dissemination and Assessment Center.

Perl, S. (1978). Five writers writing: Case studies of the composing processes of unskilled college writers. Dissertation Abstracts International, 39, 4788-A. (University Microfilms No. 78-24, 104)

Perl, S. (1979). The composing processes of unskilled college writers. Research in the Teaching of English, 13, 317-336.

Phi Delta Kappa. (1984). Planning for microcomputers in the curriculum (Hot Topics Series). Bloomington, IN: Center on Evaluation, Development, Research.

Pianko, S. H. (1977). The composing acts of college freshman writers: A description. Dissertation Abstracts International, 38, 3983-A. (University Microfilms International No. 77-27, 956)

Pick, H. L., & Saltzman, E. (1978). Modes of perceiving and processing information. In H. L. Pick & E. Saltzman (Eds.), Modes of perceiving and processing information (pp. 1-20). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Prator, C. H. (1980). In search of a method. In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 13-25). Boston: Little, Brown and Company.

Radcliffe, T. (1972). Talk-write composition: A theoretical model proposing the use of speech to improve writing. Research in the Teaching of English, 6, 187-199.

Reiss, M. (1981). Helping the unsuccessful language learner. Modern Language Journal, 65, 121-128.

Rivers, W. M. (1980). Listening comprehension. In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 265-277). Boston: Little, Brown and Company.

Rogers, S. (1983). The talking apple. Technological Horizons in Education Journal, 12(7), 102-103.

Rosen, L. (1979). An interview with Janet Emig. English Journal, 68(7), 12-15.

Ross, J. (1976). The habit of perception on foreign language learning: Insights into error from contrastive analysis. TESOL Quarterly, 10, 169-175.

Ross, S. M., & Campbell, L. (1983). Computer-based education in the Montessori classroom: A compatible mixture? Technological Horizons in Education Journal, 10(6), 105-109.

Rubin, J. (1975). What the "good language learner" can teach us. TESOL Quarterly, 9, 41-51.

Ryan, C. (1983-1984). Checklist for CAI demonstration project proposal development. Bilingual Journal, 8(1 & 2), 32, 33, 48.

Saracho, O. N. (1982). The effects of a computer-assisted instruction program on basic skills achievement and attitudes toward instruction of Spanish-speaking migrant children. American Educational Research Journal, 19, 201-219.

Schantz, L. M. (1983). The computer as tutor, tool and tutee in composition. The Computing Teacher, 11(3), 60-62.

Schwartz, H. J. (1983). Teaching organization with word processing. Computers, Reading, and Language Arts, 1(3), 34-35.

Schwartz, L. (1983). Teaching writing in the age of the word processor and personal computers. Educational Technology, 23(6), 33-35.

Schwartz, M. (1982). Computers and the teaching of writing. Educational Technology, 22(11), 27-29.

Schwartz, M. (1983). Revision profiles: Patterns and implications. College English, 45, 549-558.

Selfe, C. L. (1983, April). New wave CAI for college composition instruction [Letter to the editor]. Educational Technology, 23(4), 37.

Shaughnessy, M. P. (1977). Errors and expectations: A guide for the teacher of basic writing. New York: Oxford University Press.

Silverston, R. A., & Deichmann, J. W. (1975). Sense modality research and the acquisition of reading skills. Review of Educational Research, 45, 149-172.

Sommers, N. (1978). Revision in the composing process: A case study of college freshmen and experienced adult writers. Dissertation Abstracts International, 39, 5374-A. (University Microfilms International No. 79-05, 022)

Spack, R., & Sadow, C. (1983). Student-teacher working journals in ESL freshman composition. TESOL Quarterly, 17, 575-593.

Spolsky, B. (1980). What does it mean to know a language? In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 26-42). Boston: Little, Brown and Company.

Spradley, J. P. (1980). Participant observation. New York: Holt, Rinehart and Winston.

Steinberg, E. R. (1980). A garden of opportunities and thicket of dangers. In L. W. Gregg & E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 155-167). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Stern, H. H. (1980). What can we learn from the good language learner? In K. Croft (Ed.), Readings on English as a second language for teachers and teacher trainees (pp. 54-71). Boston: Little, Brown and Company.

Stevens, V. (1984). Can CAI be evaluated? TESOL Newsletter, 18, 16, 18.

Suttles, A. L. (1983). Computers & writing: Contemporary research & innovative programs. Computers, Reading, and Language Arts, 1(1), 33-37.

Taylor, B. P. (1975). Adult language learning strategies and their pedagogical implications. TESOL Quarterly, 9, 391-399.

Taylor, B. P. (1981). Content and written form: A two-way street. TESOL Quarterly, 15, 5-15.

Taylor, B. P. (1982). In search of real reality. TESOL Quarterly, 16, 29-42.

Taylor, B. P. (1983). Teaching ESL: Incorporating a communicative, student-centered component. TESOL Quarterly, 17, 69-88.

Thiel, F. (1980). Sights, sounds, and scents: The physical side of foreign study. Modern Language Journal, 64, 434-440.

Vygotsky, L. S. (1962). Thought and language (E. Hanfmann & G. Vakar, Eds. and Trans.). Cambridge, MA: M.I.T. Press. (Original work published 1934)

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Watson, C. B. (1982). The use and abuse of models in the ESL writing class. TESOL Quarterly, 16, 5-14.

White, B. L. (1975). The first three years of life. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Whiteman, M. F. (1980). What we can learn from writing research. Theory Into Practice, 19, 150-156.

Willer, A. (1984). Creative writing with computers: What do elementary students have to say? Computers, Reading, and Language Arts, 11(1), 39-42.

Willis, V. J. (1979). Educational technology: A valuable "third tongue" in second language classrooms. Educational Technology, 19(8), 18-23.

Winfield, F. E., & Barnes-Felfeli, P. (1982). The effects of familiar and unfamiliar cultural context on foreign language composition. Modern Language Journal, 66, 373-378.

Withey, M. M. (1983). The computer and writing. English Journal, 72(7), 24-31.

Wresch, W. (1982). Computers in English class: Finally beyond grammar and spelling drills. College English, 44, 483-490.

Wresch, W. (1983). Computers and composition instruction: An update. College English, 45, 794-799.

Young, R. E. (1978). Paradigms and problems: Needed research in rhetorical invention. In C. R. Cooper & L. Odell (Eds.), Research on composing: Points of departure (pp. 29-47). Urbana, IL: National Council of Teachers of English.

Zamel, V. (1976). Teaching composition in the ESL classroom: What we can learn from research in the teaching of English. TESOL Quarterly, 10, 67-76.

Zamel, V. (1982). Writing: The process of discovering meaning. TESOL Quarterly, 16, 195-209.

Zamel, V. (1983). The composing processes of advanced ESL students: Six case studies. TESOL Quarterly, 17, 165-187.

Zampogna, J., Gentile, R. J., Papalia, A., & Silber, G. R. (1976). Relationships between learning styles and learning environments in selected secondary modern language classes. Modern Language Journal, 60, 443-447.

Zoller, P. (1974). Composition and the computer. System, 2, 3-6.

BIOGRAPHICAL SKETCH

Sharon Staggs Moya was born on May 12, 1946, in Xenia, Ohio.

She earned a B.A. in sociology from Westhampton College, University of Richmond, Virginia, in 1968. After completion of this degree, she worked as a social worker for a year and then joined the Peace Corps. She served as an elementary and secondary English-as-a-second language (ESL) instructor and ESL teacher trainer during her 3.5-year stay as a volunteer in Liberia, West Africa.

In 1975 she earned an M.A. in linguistics with a specialization in ESL from the University of Florida. During work on her M.A., she was a graduate teaching assistant at the English Language Institute of the University of Florida where she taught ESL to both graduate and undergraduate students.

After finishing her M.A., she spent 4 years living in rural Peru where she did volunteer ESL teaching at the secondary level.

Upon return to the United States, she entered the doctoral program in the College of Education at the University of Florida. At varying times during the course

of her doctoral work, she taught community education ESL courses, she served as the evaluator at the Bilingual Education Service Center Title VII Project at the University of Florida, she taught ESL to graduate and undergraduate students at the English Language Institute of the University of Florida, she held a graduate teaching assistantship with the Department of Subject Specialization, and she was a Title VII Bilingual Fellow.
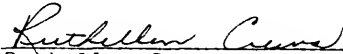
After being admitted to candidacy for a Ph.D., she lived for 2 years in Barcelona, Spain, where she taught ESL at a local language school.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.
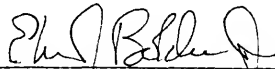
Clemens L. Hallman, Chairperson
Professor of Instruction and
    Curriculum

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.
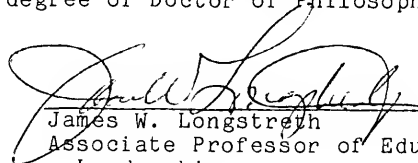
Ruthellen Crews
Professor of Instruction and
    Curriculum

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Elroy J. Bolduc, Jr.
Professor of Instruction and
    Curriculum

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

James W. Longstreth
Associate Professor of Educational
    Leadership

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Eugene A. Todd
Professor of Instruction and
Curriculum

This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1987

Dean, College of Education

Dean, Graduate School